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E.D.A.'s Call to the Industry.

WE have stated here repeatedly, and most emphatically, that what the electricity supply industry needs is a thoroughgoing policy of publicity—soundly based, intelligently and consistently applied by men who know their work, and enthusiastically and generously supported by all interests. If ever our convictions were justified they are so at this moment. We therefore return to the subject with emphasis hoping that what we may venture to say will be seriously read and responded to by the large number of undertakings and men who, either by sheer indifference or through lack of knowledge, are preventing such an expansion of the operations of the Electrical Development Association as would make our islands ring with one great resounding and triumphant shout of the place that electricity can, and indeed must, occupy in our modern and coming civilisation. If the electrical profession and industry believe in their own commodity, let them act as though they did so. Then, instead of an annual trickle of funds, there will be such a flood of financial assistance as will make it possible for E.D.A. to perform with greater efficiency some of its present duties, to conduct them on a larger scale, and to take in hand some legitimate enterprises that lack of funds now compels it to leave undone.

At the present time E.D.A. can only spend between £30,000 and £40,000 per annum upon its many and varied operations. Place such figure beside the many millions of our population whom we desire to reach, beside the hundreds of millions of money invested in electrical industrial, electricity supply, electrical contracting, and allied interests, and it surely must appear to be paltry in the extreme. This is particularly so when we bear in mind the fact that we are supposed to be on the threshold of the Electrical Age, and that the gas industry is no puny whining thing, but is alive, alert, progressive, and enlightened enough to provide propaganda sums which should wither us with shame.

Let it not be imagined that we are unmindful of the great work that E.D.A. is doing through its Circle movement, or that we fail to recognise the excellent efforts that many electricity supply concerns put forth on their own account in their own areas. Of course there are many local influences at work all over the country which tend to a gradual "leavening of the whole lump." But this is not sufficient for the present situation. The speeches delivered at the annual luncheon of the Association held last Friday, and reported on another page, may be left to tell their own story at the moment. The details need not be reiterated in this column, just now at any rate, but the outstanding feature of the situation to-day is that with the Electricity Commissioners and the Central Board in being and efficiently operating, we have to concentrate upon more energetic and highly organised selling of electricity. That will be our great work for years to come. As somebody said last week, that work includes foremost "the conversion of the public."

For this reason we welcome the appointment of Alderman E. Huntsman as President of the Association for the ensuing year. Alderman Huntsman is a layman; that is, he is not directly a member of the industry or profession. Nevertheless, he has had considerable experience of electricity supply as chairman of the Nottingham Corporation Electricity Committee, and he can be relied upon to combine with a knowledge of what the public wants a full understanding of the industry's position and problems. Alderman Huntsman made a very favourable impression upon last Friday's gathering by his admirable tribute, most eloquently expressed, to his predecessor in the office, the late Dr. S. Z. de Ferranti.

The new Chairman of the Council, Mr. H. Marryat is a veteran of the industry. We refer, of course, to his experience; his abundant energy forbids us to consider him a veteran in any other sense. He has always been a leader in the counsels of that most influential section of the industry, the contractors or installation engineers, and he should do much in co-operation with the new president to improve the relationships between municipal supply authorities and contractors. Moreover, he is a collector of funds of some note. His presidency of the E.T.B.I. was marked by a record collection for that Institution's funds. He will find ample scope in his new position for the exercise of that persuasiveness which he then displayed, for there is no doubt that E.D.A. is poorly supported by those whose interests it fosters.

It is almost incredible that 50 per cent. of the supply undertakings are not contributing to the Association's funds; that they are content to let the other half provide the money which brings *them* business. E.D.A.'s influence is now felt throughout the country and it brings benefits both to the just (those who subscribe) and the unjust (those who do not).

Unfortunately it is unable to sustain that constant hammering-in of the electrical idea which is so necessary in these days of intensive advertising. The experience of all producers of popular commodities has shown that spasmodic efforts are nearly valueless. Their goods have to be kept constantly before the public. We do not suggest that electricity should be compared with, say, cigarettes, but it is undoubtedly the fact that E.D.A. should be able to impress electricity indelibly upon the public mind by more frequent appearance of its telling advertisements in newspapers all over the country, by displaying its films in all the kinemas, by intensified lecture campaigns, by the erection and equipment of model all-electric houses in every town, and by a hundred other methods.

The industry not only has the money; it cannot *afford* not to spend it in this way if progress is to be maintained and speeded up.

We therefore endorse the Association's appeal to all sections of the industry to subscribe in greater measure, with a sure recompense; and we direct that appeal to the particular attention of the many electricity supply undertakings which, from shortsightedness or a distorted sense of economy, still stand aloof.

Medical Electricity.

So much has been said and written lately of the economic and comfort-bringing properties of electricity, that the importance of its applications in medicine and surgery are possibly in danger of being overlooked. The paper read by Mr. Bernard Leggett before the I.E.E. last week expressed the views of one qualified to speak from the points of view of the electrical engineer, the surgeon, and the physician, and gave a masterly review of the present position of this aspect of electrical development. He dealt particularly with the subject of radiology, for recent developments in the electrical side of which readers may be referred to the account of the Radiological Exhibition appearing in our issues of December 27th, 1929, and January 3rd, 1930.

This country has been a pioneer in radiology, whether in the electrical or the medical professions, the late Mr. A. A. Campbell Swinton being a notable representative of the former, while manufacturers of apparatus have held, and still hold, a foremost position. Great Britain also was responsible for convening the first international conference on radiology. It would appear, however, that the science has not made the headway in this country that might have been expected from its brilliant start. This is attributed by the author largely to the fact that the radiologist is here regarded as a radiographer only and is not expected to diagnose. There was evidence of difference of opinion among the distinguished guests of the Institution who took part in the discussion of the paper, but we incline to the view that the medical qualifications of the radiologist should take precedence over his electrical knowledge. The primary consideration should be the safety of the patient rather than of the operator—a view that the heroic record of sacrifices by early practitioners proves to have animated the medical profession. For this purpose medical training is more essential than the knowledge required for the safe handling and operation of high-voltage apparatus, particularly if, as Mr. Leggett suggested it should be, its installation is governed by the Home Office regulations. A knowledge of physics is required in either case and that should be common ground of the two professions; the achievements of medically qualified radiologists show that enough electrical knowledge for the purpose can be included in the curriculum without too great a strain on a man whose outlook is fundamentally scientific.

Electricity as a therapeutic agent has so often attracted and provided a rich field for exploitation by the charlatan, and its inexpert use is so often attended by danger, that we think the claims of the medical profession in this connection should not be discouraged, provided the position is safeguarded of those whose knowledge is based upon experience rather than upon medical theory.

Practical Welfare Work.

When the Industrial Revolution occurred during the last century and the small firm began to give way to the large industrial unit, it was lamented that the personal relationship between master and man was ended and the man had become a mere cog in a soul-less machine.

Nowadays, however, although the units tend to become still larger with even less chance of personal touch between the "masters" and the workers, there has arisen a new spirit in industry embodied in the word "welfare." This may be described as a growing realisation on the part of employers that although a man may be engaged on a purely mechanical task he is still human and will respond to humane treatment.

In this issue we publish some notes upon an excellent example of welfare work put into operation by the Metropolitan-Vickers Electrical Co., Ltd., at its Trafford Park works. This is a thoroughly modern system for safeguarding the health of the employés and it operates in conjunction with other phases of the company's welfare work.

While we would not suggest that such a scheme is possible in every works, we consider that it is a manifestation of a spirit which leads to better relations in industry and should be more widespread.

A Proposed Electrical Marketing Board.

The author unfolds for the consideration of the industry a scheme under which manufacturers, supply authorities, wholesale distributors, contractors, and retailers would co-operate in setting up an Electrical Appliances Marketing Board, it being suggested that, assuming a movement in which all sections and individuals gave of their best, electricity and its advantages would thereby rapidly be brought within everybody's reach.

By J. WILSON, Past-President of the Electrical Wholesalers' Federation.

THE many expressions of opinion on the desirability of the closest co-operation being introduced between the various sections of the electrical industry have undoubtedly been made on realisation of the responsibility which rests upon those engaged therein, and from feelings that increased demand for electricity can be hastened, its use extended, and the economical and efficient marketing of electrical fittings (using the word "fittings" in the same sense as under the Electricity Act, 1926) more readily attained through the aid of such co-operation.

In view of this circumstance, I would ask for consideration to be given to a proposal for the establishment of an Electrical Appliances Marketing Board, which would also (as so aptly stated by the president of a well-known and important electrical association) act as a central "Council of the Industry."

I suggest that the Electrical Appliances Marketing Board be composed of representatives of manufacturers, supply authorities, wholesale distributors, contractors, and retailers.

The Marketing Board, fortified by undertakings from these sections to give it their full and united support, would function as follows:—

1. To foster and promote the sale of the products of the manufacturers within the Marketing Board.
2. To operate showrooms and demonstration rooms in the principal cities and towns, and to cover rural and urban districts by travelling demonstration vans.
3. To see that agreements between all sections of the industry are carried out.
4. To promote a uniform hire-purchase scheme.
5. To create an efficient "after sales service."

The main agreements held by the Marketing Board would be:—

(*a*) *From the marketing houses:*—An undertaking to sell, and foster and promote the use of, products of the manufacturers within the Marketing Board, to the exclusion of the products of manufacturers outside the Board, along with an undertaking to pay a contribution, based on turnover, to the Board.

Mr. J. Wilson,
Past-President of the E.W.F.

(*b*) *From the manufacturers:*—An undertaking to distribute the whole of such of their products as come under the heading of "Fittings under Electricity Act, 1926," through the marketing houses within the Board, along with an undertaking to pay a contribution, based on turnover, to the Board.

The funds received by the Marketing Board from the above sources to be used for the purposes mentioned in sections 1, 2, 3, 4, and 5 above, and for the purpose of according rebate on purchases to certain classes of buyers, who undertake to stock, install, and use Marketing Board products.

Manufacturers within the Marketing Board would receive compensation in return for their monetary contribution, time, and thought, expended in such co-operation:—

From assurance of the whole of the business of the marketing houses within the Marketing Board. From the wholesale marketing houses taking standard packages or cartons direct from the manufacturers' works, and they, the wholesale marketing houses, doing the splitting-up to meet the requirements of the contractors, retailers, and industrial users.

From removal of much of the expense of maintaining branch showrooms and demonstration rooms, as being unnecessary, in view of the Marketing Board's activities in this direction.

From economy of working hire-purchase business under a Marketing Board uniform combined hire-purchase scheme.

From greater demand, which could be so much hastened by a full measure of co-operation as defined above.

From bringing our manufacturers' costs more into line with the foreign manufacturers' costs of marketing.

From conservation of the home market in such products, leaving our manufacturers free to devote more time to the development of export markets; free to devote more attention to the sale of products of their manufacture which do not come within the province of the marketing houses' business, such as generating plant,

large motors, heavy switchgear, transport equipment, &c.; and free to cope with developments in large schemes at home and abroad, such as Electricity Commissioners' schemes, railway electrification, docks and harbour board schemes, &c.

Similarly, our marketing houses would receive compensation in return for their support:—

From the defining and conserving of their field of activity.

From a settled form of trading.

From co-operation of the manufacturers, and assurance therefrom of marketing through them.

From the assistance of the Marketing Board under sections 1, 2, 3, 4, and 5.

Means can be provided whereby it can be ascertained through the Board that the marketing houses are not getting too great a reward. Similarly, means can be provided through the Board to see that the marketing houses are adequately rewarded proportionately to the parts they play in the scheme of things electrical.

The setting up of this Marketing Board need not dispense with, or interfere in any way with the existing, what I call, domestic associations and organisations on the manufacturing, supply authority, and marketing house sides.

Roughly, the commodities coming within the classification of "fittings" (Electricity Act, 1926) I would define as follows:—Wiring supplies, lamps, cables (v.i.r. and c.t.s.) and flexibles, fittings—home, shop, and industrial, heating and cooking appliances, conduits and fittings, switchgear, radio valves, radio sets and components, electro-medical apparatus, and domestic appliances.

All goods marketed under such co-operation should bear the name and/or trade mark of the manufacturers, along with the words, wherever possible, "Electrical Appliances Marketing Board Products," or the letters and word "EAMB Product," for these marks would stand as silent salesmen, and as an advertisement to all users that our manufacturers and marketing houses were energetically tackling the problems of economical and efficient marketing in a spirit of co-operation, to the greatest benefit of all.

In my opinion, such co-operation in expenditure and effort will bring the greatest economy and efficiency in marketing, provided that it does not produce monopoly, which takes away the urge and incentive to gain the reward which individual effort, initiative, and ability, should always obtain. Individualism should be retained to the greatest possible extent; yet individuals must realise that reward and object in life are commonweal, and to attain this reward they must dovetail their operations so as to aid to the greatest possible extent those who are making equal efforts to assist them towards economical and efficient marketing, for striving for individual gain, unrestrained, and without thought of the effect on others, is but the expedient of the moment, and is too shifting to result in permanent benefit, either to the seeker after individual gain or to those he serves.

The Marketing Board, whilst conserving to each marketing house member the greatest amount of individual liberty within the bounds of such members' undertakings, should have the power to investigate as to whether marketing house members are working with economy, efficiency, and energy.

I venture to say that a statement on the reasons why the best results have not been obtained from our past efforts will, at the very least, disclose that each group has felt that there were many shortcomings in all but its own section, and that no section other than its own was essential to the best interests of the industry and those which it served. It is, therefore, very refreshing to note the many recent expressions of a desire for co-operation, which will remove misgivings; co-operation which will define and conserve the field of activity of each section; co-operation which will see that all are pulling the same way; co-operation which will lay it down that service will be rewarded; co-operation which will determine that that reward will only come from service.

I am advised that the question of co-operation in the electrical industry received consideration, as being a desirable object, over 23 years ago, and has been raised on many occasions since. How much more desirable must it be then after a generation of development of availability and applications, and at a time when, by national schemes of distribution of electricity, associations and amalgamations on the manufacturing side, and associations in marketing, we have gone a long way towards establishing that interests which at one time were thought to be divergent are largely identical?

Scientific research will discover still further applications for the use of electricity, but even if such discoveries come but slowly, we can see a tremendous field before us, a field that is almost limitless, for electricity is the greatest instrument in the maintenance or strengthening of a nation's industrial position. It is essential to economical production in factory and agriculture, essential to the comfort of homes, and the welfare and enjoyment of all people; its applications will sustain health and all these, and its curative powers, demand from each and every one their best and strongest efforts to increase its availability at the very earliest possible.

The establishment of an "Electrical Appliances Marketing Board" functioning in the manner suggested herein, with each individual and each section within the industry contributing the best that is in them, is, I feel, one method of carrying through the responsibility which rests upon all of bringing, without delay, electricity with its essential applications, within the reach of all humanity.

Employment Management.

Under the auspices of the Industrial Welfare Society a conference on Employment Management was held at the Hotel Victoria, London, on March 21st.

Mr. R. R. Hyde, director of the Society, presided, and, opening the proceedings, said that in the search for efficiency it should not be forgotten that industrial activities should not be anti-social. Each employer had a responsibility towards the individual worker as well as to the State.

Mr. A. P. Young, O.B.E., manager of the Rugby works of the British Thomson-Houston Co., Ltd., in a paper on "The Employment Department," maintained that rationalisation would not solve the problems of industry unless it completely satisfied the demands of the human factor. The scientific selection, testing, and adaptation of raw materials had made a great advance; it was necessary to apply somewhat the same line of thought to human "materials" entering industrial organisations. The problem was complicated by the diversity of human character, and it was necessary to take special steps to understand and meet that diversity. He described in some detail the methods adopted at the B.-T.H. works, Rugby, for the engagement of employés, and said that it seemed to be a logical step to have a special department for the purpose. That had been done by many companies, and it was claimed that the employment organisation had paid for itself many times in reduced labour turnover and improved efficiency. The conditions under which the employés had to labour should be improved by every possible means, so as to ease the physical strain on the workpeople, increase their productivity, and enable them to earn more. The Employment Manager of the future must be a man who believed and felt that industrial progress depended on the absorption of those principles by employer and employé, and he must have, associated with this belief, the power of communicating his ideas and ideals to those with whom he came into contact. He should be familiar with the details of the business, and have intimate knowledge, through personal experience, of factory life and conditions.

Sir Harold Morris, K.C., was the principal speaker at a luncheon which followed the morning session, and in the afternoon Mr. Percy A. Best (James Shoolbred and Co., Ltd.), read a paper on "Staff Management."

The New Metropolitan-Vickers Ambulance Department.

An Up-to-date Example of Practical Welfare Work.

MODERN industrialists realise that to give proper attention to the health of their employés is not only humane but also "good business." The following notes on the new Ambulance Department of the Metropolitan-Vickers Electrical Co., Ltd., show how this realisation has been given practical effect to in a very thorough manner.

Statistics covering the past 50 years show that the normal expectation of life has appreciably increased. This can be attributed to many causes, including improvement in public health and sanitary conditions, and improved methods of dealing with disease. Coupled with these obvious causes are some less apparent to the casual observer, such as the shortening of the working day and the provision of medical attention whilst at work. Like the majority of large firms in this country, the Metropolitan-Vickers Electrical Co., Ltd., has provided first aid and ambulance equipment on quite a considerable scale from the time its works first started in 1901, as it was realised that even in an engineering factory, owing to the nature of the work and the materials handled, the risk of sepsis resulting from minor injuries had to be recognised.

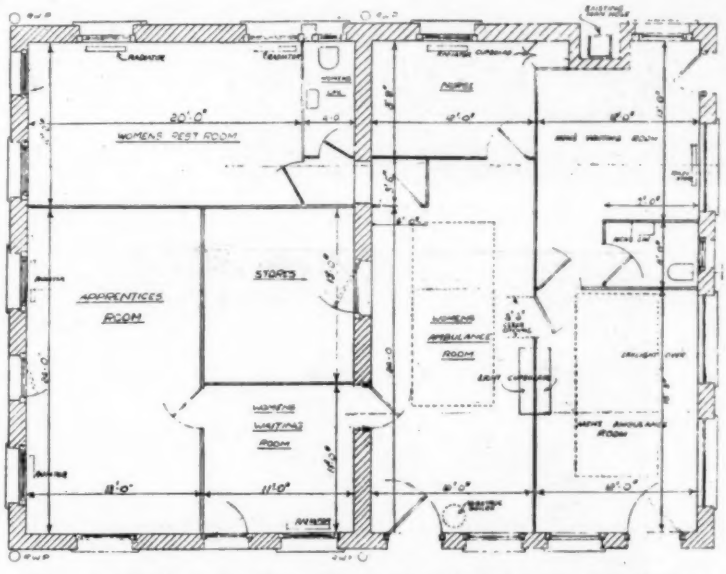


Fig. 1.—Plan of the New "Metrovick" Ambulance Department.

Engineers and their kind are inclined to scoff at cuts and bruises and to let many minor accidents pass unheeded, but they are beginning to realise that prompt treatment considerably curtails the period of discomfiture and, in addition to the benefit to the employés themselves, the decrease in absence from work due to accidents is mutually advantageous to everyone in the factory. As this appreciation grew, it was felt that the ambulance and first aid provisions could be extended and modernised with advantage, and in January last a new and very completely equipped ambulance station was opened.

In the selection of the site care was taken to find the most central position, not only for present requirements but also for future developments; easy access to the main thoroughfare had also to be borne in mind. With these points in view, the enlargement and reconstruction of

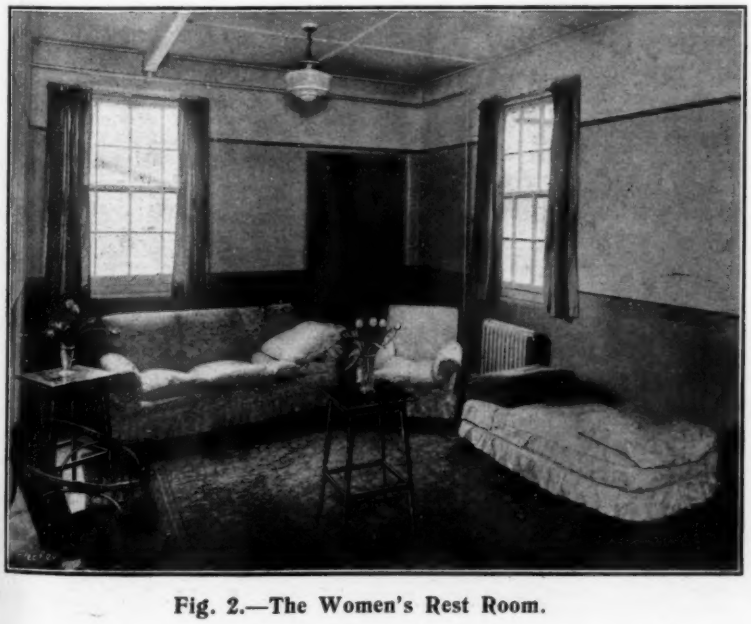


Fig. 2.—The Women's Rest Room.

Fig. 3.—The Men's Waiting Room.

what was originally the men's ambulance was undertaken and completed without disorganising existing arrangements. The overall size of the new ambulance department is 51 ft. 6 in. by 38 ft. 6 in. There are separate treatment and waiting rooms for men and women; a nurses' room; women's rest room; stores; and an additional room for the use of the doctor and for the administration of ultra-violet radiation treatment. The shell of the building is brick, but all internal partitions are of steel, carried to the ceiling and glazed from 4 ft. above the floor with sand blasted obscured glass. The walls of the ambulance rooms are enamelled white, the waiting rooms cream and brown, and the rest room cream and blue. In the ambulance rooms the floors are terrazzo with rounded corners; elsewhere a composition is used. To ensure the best possible lighting and ventilation, glass roof lanterns with opening lights have been installed as well large side windows; the artificial lighting is by means of powerful electric lamps enclosed in white bowls. In the summer very little heating is required as the position is a sunny one, but for the winter tubular electric heaters are used in the ambulance rooms and low pressure hot-water radiators and pipes for the rest of the building. In order to give a greater atmosphere of comfort the rest room has in addition a "Cosmos" electric fire.

Fig. 4.—Illustrating the Adequacy of the Equipment.

Fig. 5.—Men's Ambulance Room.

Fig. 6.—Women's Ambulance Room.

The equipment for the ambulance rooms was chosen with the approval of the company's medical adviser; it is on strictly hospital lines with the recognised porcelain sinks and white-enamelled metal furniture, theatre trolleys, instrument cupboards, stretchers, &c., and an ultra-violet radiation lamp.

In addition to the provision of the building and equipment, it was essential to have a trained and efficient staff. Two State-registered nurses, one for the men's section and one for the women's, are in attendance during the whole of the working day. In the men's section there is also a first-aid man, while a probationer relieves at busy times and is responsible for the stock-keeping and issuing of stores, &c. With men working during the night, the ambulance is never left, and a first-aid man comes on duty as the day man goes off, and is responsible until the arrival of the nurse in the morning. The actual treatment is in accordance with that advised by the works medical officer. The ultra-violet radiation is also under the latter's supervision, and the patient's own doctor is always consulted before a course of treatment is given. This ultra-violet radiation treatment has been carried out now for several years and in many cases excellent results have been achieved.

Records are kept of those visiting the ambulance room and cases are followed up, particularly where sepsis is suspected. Various statistics are kept and it is hoped that much useful information will be obtained. Reports of all accidents are sent to the Superintendent of Labour who is responsible, not only for reporting accidents to the Factory Department, but also for carrying out the obligations of the company under the Workmen's Compensation Act.

It is hardly possible without a close and intimate knowledge of the factory to visualise to what extent the ambulance department is linked up with the various activities of the organisation. It is perhaps enough to say in summary that it has its connections not only with the works side, that is, with the individual departments, foremen, superintendents, &c., but it also works in conjunction with the Works and Safety First

Committees, the Works Benevolent and Workmen's Compensation Funds, the contributory Hospital Treatment Scheme, as well as outside the factory with the doctors, hospitals, convalescent and holiday schemes, and to some extent in the homes of the people themselves.

Since the improvement in the ambulance room arrangements, and due to the efforts of the Safety First Committee, the old disinclination on the part of employés to attend for treatment has practically disappeared.

The plan and illustrations which accompany these notes plainly show the ample accommodation of the new building and the excellence of the arrangements.

A Millboard Factory.

Electricity is used extensively at the works at Bourne End, Bucks., of Messrs. Jackson's Millboard and Paper Co., Ltd., where there is a self-contained electrical installation.

(*Concluded from page* 531.)

Apart from the pulping processes, the remaining operations throughout the factory are practically the same, and it will be sufficient for us to describe the sequence of operations from the large beater. From the inside of the extractor drum the plup mixture flows into a wood weir box, from which it is removed by means of a three-throw pump, fig. 9, and lifted to a sand trap. These pumps are of the variable-speed type, operating at from 15 to 30 strokes per min., and were made by Watford Engineering Works, Ltd. They are driven by a 15-h.p. motor controlled by a solenoid-type panel somewhat similar to that already mentioned, but with provision for speed variation. This type of control panel gives push-button control of starting and stopping, with provision for acceleration to a set speed, determined by the position of the speed regulator, so that on each fresh start it is not necessary to regulate the speed to the required figure, as the speed regulator can be left in the proper position and the motor will automatically accelerate thereto. The sand trap consists of a series of wood troughs through which the mixture flows over a number of weir boards, heavy materials sinking to the bottom. After passing from the sand trap the mixture is subjected to a thickening process for the removal of water. The thickening is effected by a revolving drum with a gauze-like shell. The mixture travels with the drum over its top surface, and the water drains through to the inside of the drum, leaving the thickened mixture on the surface of the drum in the form of a sheet. The thickener is driven by a 7½-h.p. motor controlled by a solenoid-type panel. The water from the thickener is picked up at one end by a 6-in. Gwynne pump driven by a 9½-h.p. motor, with a drum-type controller, and returned to the sand trap.

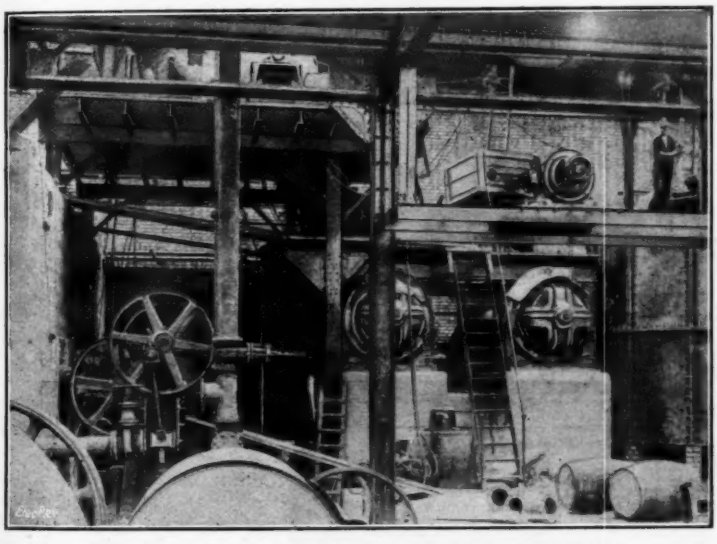


Fig. 6.—Progress Illustration showing Refiner Motors.

If the stuff from the beater is not required for use at once it is by-passed from the continuous process into chests for storage, and while in store it is agitated by suitable equipment driven, in each case, by a 7½-h.p. motor.

From the thickener the mixture is fed into head boxes and then into two "Bentley & Jackson" refiners. These machines work on the coffee-mill principle, with cutters in the body and plug. They are located immediately under the head boxes at the end of the thickener, and are driven by 100-h.p. motors. Fig. 6 is a reproduction of a progress photograph, showing the two refiner motors. On the right is the vertical pulp-storage chest. A portion of the large beater may be seen at the bottom left, and

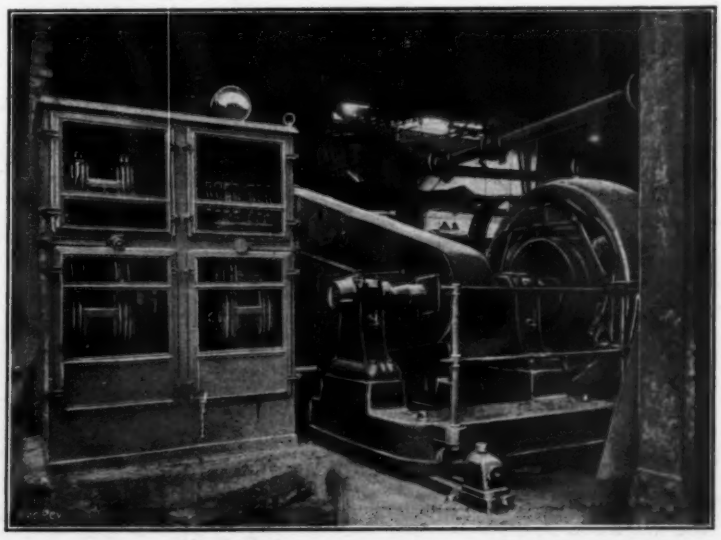


Fig. 7.—Reversible Machine and its Control Equipment.

the small motor for driving the extractor drum is shown immediately over the right refiner motor. On the extreme upper gallery is indicated the sand-trap

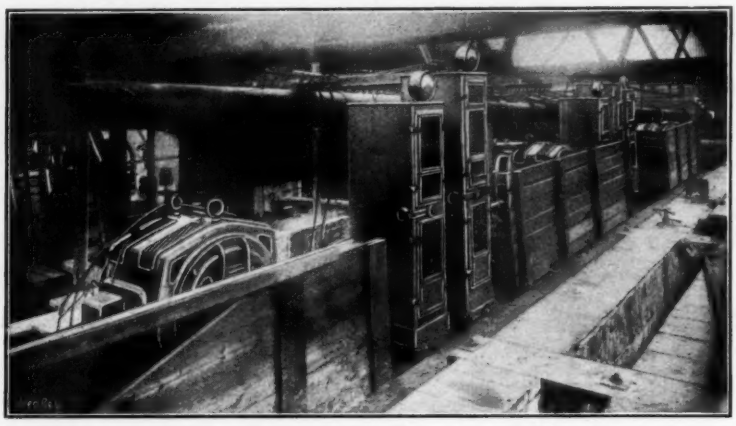


Fig. 8.—Machine Chests; 30-h.p. Pump and Agitator Motors.

equipment. The refiners are directly coupled and run at 300 r.p.m. The sequence of operating them takes the pulp to the machine chests, where it is held in a state of agitation in preparation for the machine work. There are three of these chests, situated at about 10 ft. below the machine-floor level, and each chest is served by a 30-h.p. motor, which provides for both the pumping and agitation. These motors are controlled by solenoid-type panels. The drives are through belt and shafting, and the control is fully automatic. Fig. 8 is a view of the machine-chest equipment, showing the three motors and the starters. The stuff is then taken up to constant-head boxes, from which it runs down on to the machines on which, after being strained, it is taken into a vat. On the machines the pulp is carried round a drum with a fine-mesh wire shell, in a similar manner to the operation in connection with the thickener, and a wet travelling felt picks the sheet off the drum and carries it on to the making roll. The function of the making roll is to "lick" the pulp off the wet felt to a required thickness, which is automatically determined and signalled. A groove in the making roll allows the continuous wet sheet of material to be cut through, when it is lifted off and thrown on to a truck for conveyance to the scene of the next operation. Fig. 10 is a view in the machine room; the machines are driven by 15-h.p. motors.

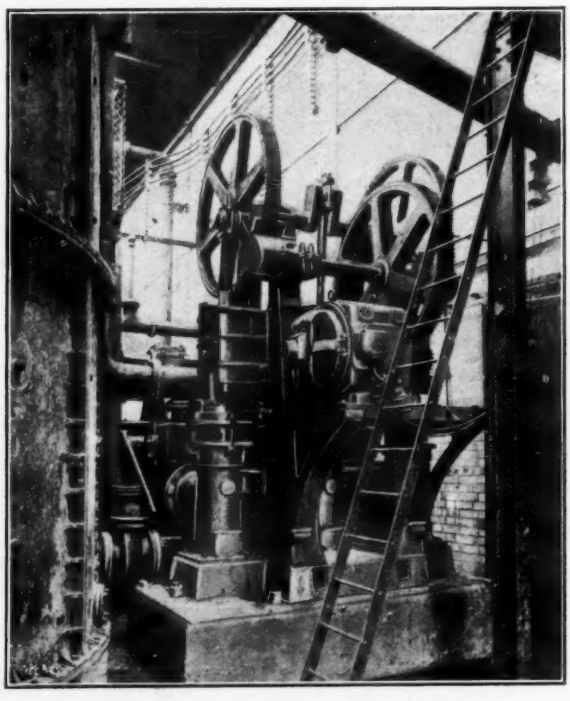


Fig. 9.—Pumps for Lifting Pulp to Sand Trap.

The next process is to squeeze some of the water out of the sheets and to compress the material, and this is effected in 500-ton, 36-in. ram hydraulic presses. Before being pressed, the wet sheets comprise two-thirds water and one-third material, and the boards, as they might now be termed, leave the presses as equal quantities of water and fibre. The boards are next hung in portable racks and taken through the drying ovens, through which hot air is blown by "Fouche" fans driven by 60-h.p. motors. The air is heated by the "process" exhaust steam from the turbine.

When they leave the drying room the boards are bone dry, brittle, and hard. They are then put through a spray damper and stood out for 24 hours to condition. Flattening and polishing is the next operation, and this is done by calendering. There are five calenders; four are driven from the main shaft and one is driven by a separate 75-h.p. motor. The boards are next cut up into various sizes by rotary and guillotine cutters, all electrically driven. The smaller machines which deal with the final stages of production are too numerous to mention; it suffices to say that it is particularly interesting, indeed fascinating, to watch all manner of guillotine, stamping, and punching machines turning out such articles as motor-car panels, pipe joints, special grinding wheels, and so on, all by the aid of electricity.

A particularly interesting example of the flexibility of electrical equipment, and, it should be said, of the ingenuity of the engineers and manufacturers concerned, is the driving arrangements for the main shaft. A 250-kW reversible motor-dynamo is used for this purpose. It is a machine which was supplied a good many years ago for providing the current for driving the mills. For use as a generator it has been compounded. It drives the main shaft through a Hans Renold chain. In the case of breakdown this machine is driven as a dynamo from the main shaft, which is, in turn, driven by a 450-h.p. Cole, Marchant & Morley tandem compound condensing reciprocating engine. This engine and a generator have been replaced by the

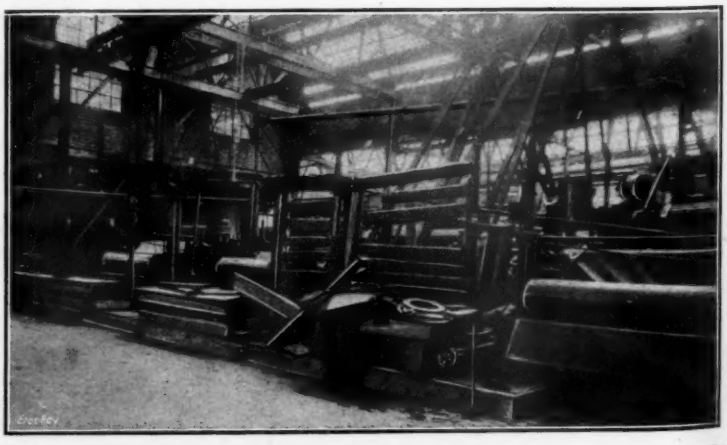


Fig. 10.—The Machine Room.

turbo-generator set already described. The old switchboard used in conjunction with the reciprocating set now serves as a distribution board. The reversible motor and dynamo is controlled by a starter specially made for the job by Brookhirst Switchgear, Ltd. It is a contactor-type starter, and the switches are so interlocked that if the machine is to be run as a generator, before it can be started the compounding must be in. Further, the machine cannot be switched in as a motor before the compounding is cut out. Speed control is provided for the machine by means of resistance in the field. Fig. 7 shows the reversible machine and its control equipment.

In conclusion, we are indebted to Messrs. Jackson's Millboard and Paper Co., Ltd., for permission to view the factory and to take photographs, and to Messrs. Newtons of Taunton, Brookhirst Switchgear, Ltd., and to Mr. Bertram Marshall, who had the direct supervision of the various contracts on behalf of the consulting engineer, for their assistance in the preparation of the above notes. Our thanks are also due to Mr. L. N. Burt for some of the photographs used.

Electricity for the Home.

A Commentary on the Design and Layout of Electric Cookers.

By A CONSUMERS' ENGINEER.

IN the design and layout of a cooker there are so many contending factors to be considered at every point that the ultimate decision with regard to any one of the points is always a compromise between what is really best for the particular purpose and that which least interferes with the functioning of the other constituent parts of the cooker.

For instance, when trying to work a hot-cupboard into the design of a cooker with a high oven, the oven has to be shorter than one wishes, the hot-cupboard smaller, or the lower shelves of the oven nearer the floor than is desirable.

Cookers can be divided into two classes: (1) floor type, in which the boiling hob surmounts the oven, and (2) bench type, in which the hob and the oven are side by side.

The first type is by far the more common, for the good reason that in the great majority of houses floor space cannot be found for the latter. The demand for the second is, however, a growing one, and will be considerably greater in future, for electric cooking is now being adopted in the larger houses, and, moreover, in new houses architects are not nearly so insistent as they were on putting in a big coal-fired range. There is a distinct and growing tendency on their part to put in a small range and often a slow-combustion stove, thus leaving the required space in the kitchen for other means of cooking.

The growth of the demand for the second type will place supply authorities, in the not far distant future, in the position of having to carry stocks of both classes; this will mean a considerable increase in capital outlay on stock cookers, in storage costs, and in the number of "spares" required.

This being so, the question arises whether or not manufacturers should endeavour to turn out a cooker which can be assembled in either of the two desired ways. Several makers have already attempted to do so, but the general result has been that the cooker when made up as a bench type has not got that finished appearance which is desired, and gives one the impression that it is a "makeshift" arrangement. This difficulty, though, should not be insurmountable.

Let us consider, in the first place, a floor-type cooker, and begin with the oven, which we will assume is to be a high one and side-heated.

The first point to settle is the disposition of the elements, so as to ensure even heating. This can only be achieved by spreading the elements over the greater part of the oven side, and particularly arranging that some part of the heaters is as near as possible to the oven bottom. The reason for some side-heated ovens not giving satisfactory results on the under sides of baked articles is that the heat is too highly placed and too concentrated. To remedy this some makers go to the trouble of putting some auxiliary bottom heat in, thus increasing their costs and robbing the oven of useful space. The root of this trouble is that an unsuitable type of element is used. A form which is quite good for a radiator bar is not necessarily so for a cooker element; it is usually the reverse. Recently one maker has introduced into a cooker bottom heat which would be unnecessary if the side elements were rearranged.

Having decided on the correct element and its position, the next point to settle is the nature of the element guard. This should be such that it would allow circulation of air round the oven, and quite small alterations in its shape will be found to make a considerable difference to its performance in this connection. It should also be of such construction that some direct radiation from the element into the oven is possible. It is not generally realised that this possibility is one of the most important features of an electric oven, and is the reason why it is possible, in cookers in which advantage is taken of it, to turn out goods which have that attractive appearance which cannot be obtained by any other means. So far as I know there are no means of determining just what quantity of direct radiation is required for any given design of oven, and it can only be found by a trial and error method. The size, number, and spacing of perforations and their positions relative to the element position and to its loading are matters which enter into the problem.

It is often argued that this effect can be more easily obtained with "top and bottom" heat. If there is only one shelf of goods in the oven, it is possible, but that is not the normal condition of use, and the interposition of the upper shelves upsets the argument altogether. Some makers have tried to obtain even heating by spreading the element over the whole of a solid side. This may or may not give the desired result in that connection, but it still fails to give that "bloom" which can be obtained only by means of a certain amount of direct radiation.

The guards themselves should be light in weight, free from any tendency to buckle, and should be so made as to act as runners for the shelves. The runners should be of such a type that they would not collect dirt and grease and would be easily cleanable. They should not be riveted to the guards, as in that case they would be sure to become loose in course of time, unless both runners and guard were of substantial thickness, which is not permissible on account of weight or mass of metal in the oven. Rod runners are easy to clean, but they are difficult to fix. The best I have seen are not, unfortunately, on an English make of cooker, and consist of a one-piece pressing.

We may now leave the oven interior and turn to the door and its fixings. Almost every cooker obtainable has its door hinged on the left-hand side, which is of course the best side. There are, however, many cases in which a right-hung door would be an advantage, on account of the position of windows or doors in a kitchen. All cookers should therefore be so designed that the hanging of the door could be easily reversed. This means that hinges, and also the door-catch, must be of a screw-in type, and that suitable holes must be provided on both sides of the oven to take them; these holes would be filled in by a neat-looking plug when not required. Incidentally, this would get rid of the " cast-in " hinges found on some cookers, the pins of which have a habit of coming loose. The door itself might have to be reversible; this would bring with it the necessity of grinding the door frame and its seating, and thus rid us of the biggest bugbear of ovens in the way of badly-fitting doors. Some difficulty would arise with regard to the ventilator position, but this could be overcome by adopting the American type of ventilator, consisting of a port in some part of the oven other than the door. Alternatively, the door frame and hinges can be so designed that it is not necessary to turn the door upside down when it has to be reversed. Of the two arrangements the latter will probably be the cheaper. Present types of ventilator are in any event too flimsy, and are liable to become fixed in position if not regularly cleaned and kept free from coagulated juices.

The drop-down door does not enter into the matter for a high oven, and even on a wide oven it is not satisfactory. It serves a useful purpose in so far as it provides a shelf on which to slide things from the bottom of the oven, but that does not always apply, and it only applies to the bottom shelf in any event. When open it prevents easy access to the oven and takes up floor space which is generally needed for a passage way. The acts of opening and closing have a greater disturbing effect on the hot air in the oven than in the case of a side-hinged door.

Turning now to the hob, we have a tough problem to decide how best to accommodate the various parts in the given space. We have to find room for two or three hotplates and a grill, and to arrange them so that we have a clear space underneath for a hot-cupboard, and still leave sufficient clearance for connections. In addition, we may have to find room for fuses.

Let us deal with the position of switches and fuses first. In a cooker of the type we are considering, the place for them would appear to be down the side of the oven, preferably placing some of them on either side, with the objects, first, of keeping them as high as possible, and, secondly, of obtaining symmetry. The reasons against so dividing them are, first, that it doubles the lateral space required, which space might not be got without exceeding the width of the hob, and, second, that if we wish later to make our cooker into a bench-type one, it may lead us into some difficulty. Bearing this in mind, the best thing to do is to put all switches down one side, but so to design the switchbox and arrange the wiring that the box can be fitted either on the left or right as required when assembled as a bench-type cooker. With regard to fuses, there is a tendency again just now to put them under the hob. This is quite definitely wrong. The times at which a fuse requires renewing are those when the cooker is in use, and it is necessary, if the fuses are under the hob, to clear it of pots and pans before a replacement can be effected. Another favoured place is on the side of the oven behind the switches. This again is very awkward when a cooker has to be stood in a corner, as is frequently the case. The proper place for the fuses is adjacent to the switches, but facing forward.

Coming back to the hob, it is necessary to decide first whether or not we are going to provide a hot-cupboard, or some plate-warming space. It is certainly necessary, and if we do not incorporate it in the cooker itself, we shall have to provide a separate cupboard. Some makers have done this in the past and have made quite a good job of it by fixing a cupboard on brackets above the hob, in the position often used for a plate-rack. It adds considerably to the cost of the complete cooker on the one hand, but on the other it reduces the cost if a cupboard is not wanted at all. If a cupboard is to be provided, we must try to incorporate it in the cooker itself. It should be high enough to take two vegetable dishes, one standing inside the other, and the only place for it appears to be the front central portion under the hob. As a cupboard to be of any use must be capable of really heating plates and dishes, the heating of it by means of stray heat from the oven top is of no use. It must be provided with its own source of heat. This can be, and generally is, provided by the grill, and a combined grill chamber and hot-cupboard is a practical proposition, if the element is arranged for three-heat regulation. It is useless otherwise, as the normal temperature from grill elements results in the cracking of plates. Care must be taken that the whole of the grill chamber and the element can be easily got at by the user for cleaning purposes. This is not the case with such an arrangement on most types of cooker.

The fixing of two hotplates only on a hob does not present much difficulty. The point to bear in mind is that they should be as far forward as possible, so as to avoid the cook having to reach to the back of the hob when stirring in pans. The introduction of a hot-cupboard underneath makes it a little bit awkward to arrange, but there is no reason why the top of the cupboard may not slope away at the back, thus enabling large plates to be placed at the bottom, with smaller ones on top of them. The hotplates can then be brought forward and space be left under them to get at the connections. The fixing of a third plate, however, on a normal-sized hob does present a very real difficulty. It is of no use to crowd the three close together, for the need of a third pan is occasioned by the fact that a considerable number of pans have to be kept on the simmer at the same time. We must therefore spread the plates over the area covered by the pans when so used. On cookers which have to cater for not more than four or five persons, three plates, although useful, are not absolutely necessary. On larger cookers they are essential, and usually it is permissible to make the hob a little larger too. The front central portion of the hob suggests itself as the most suitable place for the third plate, but we have already got the grill under there. The only other available spots are the left and right front corners. Of these the left is the more convenient for the cook, being less in her way when attending to other pots and pans on the hob. It should be kept as far in from the edge as possible, and the sloping of the left side of the hot-cupboard top, in a similar manner to the back, may be necessary.

On a cooker which has only two plates, they should, of course, be of the same size, for ease of maintenance, if for no other reason. When more than two plates are fixed, the others may with advantage be of different sizes and loadings. It is a debatable point whether the third plate should be smaller, for simmering purposes, or larger for such things as fish kettles. The decision will be largely influenced by the construction of the other two plates, which may perhaps be such that they are not as good for simmering as they might be. In that case a small plate appears to be called for, as the occasions when a number of pans are required to simmer are more frequent than when one large pan has to be brought to the boil. On the other hand, there are always ways and means of reducing the heat of a plate, when it is impossible to increase it, and in coming to a decision with regard to any one design of cooker the positions and construction of the first two plates will have a big influence on the others, or rather should have. A combined grill and hotplate should be avoided.

With regard to wiring, I believe that all connections should be of the solid type and, so far as the hob is concerned, carried on the under side of the plate, which should be hinged. When any fault occurs, it is much easier for a mechanic to work on such a hob, and he need spend less time on the premises of the consumer. This practically precludes the use of " plug-in " plates, as there is not sufficient space to fix the

necessary terminal blocks, and if there were they would be in the heat zone of the plates. Then, when the time came for them to be removed it would be found that their alleged ease of removal was non-existent. Such plates are very good in theory, but not in practice. Their use would be permissible on a hob which did not carry the wiring, so that the terminal blocks could be fixed away from the heat, but as we have used the space under the hob for our hot cupboard we have none to spare for them. If we had, they would not be easily accessible, even though the plates themselves were mounted on a frame separate from the hob, so that they were still free to be swung up on their hinges.

All plates should have some means of adjustment, so that they could be made to sit flush in the hob. Some makers fit their plates a little proud with a view to avoiding heat loss from the pan on the plate to the hob. If one pan one plate were the rule, this would be all right, but when two or more pans per plate are in use, as is more usually the case, then the pan contact with the plate is very poor, and the resulting loss in time and energy outweighs the loss in the former case. This refers, of course, to solid plates in particular and to protected plates in a lesser degree. When an open-type plate is in use there is not the objection to such raising.

Now, some attention must be given to the carrying away of the results of boil-overs. All designers do make some provision for it, but few to an adequate degree. It is essential that the whole of the spillage can be got away without any fear of its dropping across plate supports or live conductors. Otherwise it will be impossible to keep the cooker clean and sweet. Moreover, anything which drips on to a live conductor will run along or down it, and may result in a "short" across connections or on a terminal block. This is a frequent source of trouble on many cookers to which the makers claim to have given adequate protection.

A splash plate is not essential, but is desirable in so far as it adds to the appearance of a cooker. It could be easily and cheaply supplied, were it not for the fact that it must not prevent the hinging of the hob. This presents some difficulty and increases the cost. Plate racks are useful, incorporated with the splash plate, but should not be regarded as plate warmers. If there is sufficient stray heat from the hotplates to have any warming effect on dishes at that height from the hob, there is something wrong with the hotplate, until we get the open one.

Let us now consider the bench type of cooker. Here we are not tied for space so much and can therefore plan to better advantage. The only restriction of importance is that the overall width of the cooker must not exceed 4 ft. 6 in., the reason being that this is the maximum width of the opening in chimney breasts in ordinary domestic premises, and that there is a growing tendency to remove old ranges, tile the recess, and stand this type of cooker in it. Assuming that we do not increase our oven width, we are able to add anything from three to six inches to the width of the hob.

A convenient height for the surface of the hob will be from 3 ft. to 3 ft. 3 in., and for the oven bottom from 2 ft. 6 in. to 2 ft. 9 in. The hot cupboard may be put over or under the oven, preferably over, so that it absorbs any stray heat which there may be. If put under the oven, the latter will have to be raised a little. In either case it must be separately heated.

There is a number of different makes of this type of cooker already available which have quite good lay-outs, but in almost every case the assembly is poor. One maker has dropped the level of the oven and made the whole cooker of sideboard or cabinet shape, with quite a pleasing appearance, though in so doing the height of the oven has had to be reduced a little internally. It is a compromise between convenience and appearance, which has been accomplished without serious loss to the former, and it has been copied since by the makers of gas cookers.

A cooker of this type should be so designed that the oven can be placed to the right or left of the hob, as required, and it would be an advantage to have legs of the detachable type, so that legs of varying height could be fitted. In such a case the means of fixing the leg to the frame must be carefully considered. The usual method of securing by screws to the body is not good enough. They are difficult to tighten up in the first place, and when that has been done they easily work loose and result in broken legs when the cooker has to be moved; this applies to floor-type cookers as well. All feet should be finished off, so as not to tear or scratch linos or floors, and should have some provision for levelling up on uneven floors.

If a splash plate is provided, it should be such as to appear to be an integral part of the cooker, and not an afterthought. The junction of the hob with the oven body must not allow any space into which spillage can run or other dirt collect. These two points must also be kept in mind if a cooker is to be designed for assembly, either as a floor- or a bench-type one.

With regard to the fixing of a main switch as part of the cooker, I do not approve of it. Some means of terminating the consumer's circuit is necessary, and, if there is a switch on the cooker a terminal block of some sort is needed on the wall. This will cost nearly as much to fix as would a switch, and it is better to omit the switch from the cooker.

A pilot lamp is an advantage, and this should be regarded as part of the circuit and not of the cooker. Similarly, if a plug is to be provided for the use of a kettle, it should not be on the cooker. A plug should, I think, be provided, and it, together with the pilot lamp, should be incorporated in one case with the main switch. There is a wide range of such cooker control units which the buyer can choose from, but they do not come within our purview at present.

Domestic Electrical Development in France.

Persistent efforts are being made in France to popularise electricity for household requirements. Practical cooking demonstrations are now being given in French streets and market places by means of a travelling kitchen, for which the electricity is obtained by tapping the nearest main, and the actual consumption necessary for the cooking of a repast is shown by a meter in full view of the public. These demonstrations have been remarkably successful from the point of view of publicity, and have never failed to attract large and interested audiences. They have also been useful in indicating that the present needs from the suppliers' standpoint are a uniform tariff (it being difficult to convince French consumers why they should pay different rates for the same unit of electricity) stronger and better constructed apparatus, giving perfect contact with heating elements, and improved power installations, with fewer interruptions of the continuity of supply. The demonstrations have shown also that it is becoming more widely recognised by those members of the general public who have adopted electricity for domestic needs that questions of comparative costs are not of primary importance when considering the claims of electricity. Except in house holds where the consumption in any case would be trivial, it is conceded that the cleanliness and convenience of electricity for cooking purposes justify an additional 10 per cent. in the fuel bill. Particularly is this the case in the sparsely populated areas. In France gas is available only in the immediate vicinity of towns, whereas electric transmission lines are being extended more and more into the rural districts, where the fuel for heating and cooking is still the old-fashioned log or charcoal.

Small Portable Appliances in American Homes.

According to the *Electrical World*, electrical appliances produced nearly a third of the revenue received by electric light and power companies in 1928 for domestic energy sales; that is, about $169,000,000 out of a total of $556,000,000. They consumed 3,500,000,000 kWh, in round numbers, of the 8,500,000,000 kWh used in 19,500,000 American homes, the rest being mainly due to lighting. Nearly three-quarters of the appliance revenue still comes from portable apparatus that can be plugged in at any receptacle. No account is taken of 55,000,000 portable lamps, which are included in the lighting load.

Electric Cable Jointing.

The author discusses the weakest points in medium-pressure jointing, and methods of overcoming them the resistance of joints and strand to strand contact in cables; the most suitable type of soldering flux, and the main details of plumbing; dimensions of suggested standard joints; and the training of jointers.

By LAURENCE A. GRIPPER, A.M.I.E.E.

DURING recent years a great deal of prominence has rightly been given to super-pressure jointing. Whilst this has, of course, been necessary, owing to the rapid growth of high-pressure work, the author thinks that it is very questionable whether medium-pressure jointing, which is carried out on a larger scale than ever to-day, reaches the standard that it is possible to attain if joints are properly designed. To ascertain whether these views were correct it was decided to examine, test, and dissect a large number of joints of various ages of the cencentric- as well as of the cored-cable types, as although the use of concentric cable is dying out, it is, nevertheless, still used in a number of places.

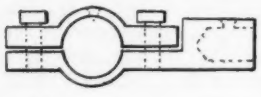


Fig. 1.—Inner Fitting for Concentric Service.

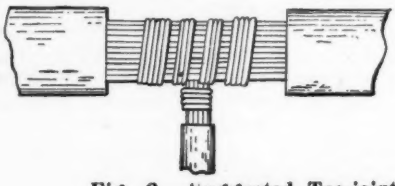


Fig. 2.—Suggested Tee-joint instead of Fitting.

A collection was therefore made of all old joints which were from time to time cut out when network alterations were taking place, and in addition to this a practice was made of cutting out joints either before or immediately after they had been filled with compound, this of course being done unexpectedly as far as the jointer was concerned. In all, eighty joints were collected of varying ages, some being approximately twenty-five years old. Further, they had been made by many types of jointers, ranging from the first-class plumber jointer to the quickly-trained service jointer.

Amongst the joints examined were the following types: (1) triple and concentric service boxes of various types and sizes; (2) cored cable "T" and "Y" type plumbed service joints; (3) triple-concentric and concentric straight joints; (4) cored cable straight joints; (5) concentric sealing ends; (6) cored cable sealing ends; and in addition a number of odd joints, network boxes, cable end seals, &c., of various sizes, types, and ages. These joints were subjected to the following tests (*a*) pressure tests (electrical), (*b*) water-pressure tests (to test plumbing), (*c*) voltage-drop and current tests, and (*d*) tension tests for mechanical strength; in addition each joint was dissected and thoroughly examined in detail, the results and conclusions reached from these tests being given under the various headings.

Triple-concentric and Concentric Service Joints.—There are two common ways of making such a joint: (1) a compound-filled iron box, (2) a plumbed lead box. In either case special fittings have to be used, if the joint has to be made alive, and owing to the importance of continuity of supply it is essential that these fittings should be properly designed to allow for bridging, as well-designed fittings lead to quicker, easier, and more reliable work.

The first point of interest was the method of "teeing" the inner core of the service cable on to the distributor. The method adopted throughout was to make use of a clamp fitting with a hole drilled in the end to take the service cable as shown in fig. 1.

Upon examination it was found that very few of these fittings were tinned to the core on the underneath side, owing to the fact that it is almost impossible in practice to tin the underside of such a fitting properly. Further, there is a definite tendency to compress the strands together, so that the solder is not encouraged to run in between them. Another disadvantage connected with the type of fitting shown in fig. 1 is that it is mechanically weak as far as tension on the service cable is concerned. This is a very important point, as service cables are often moved from their original position when the excavating work which is carried out from time to time by different bodies is in progress. To overcome these troubles the author suggests doing away with the inner fitting and making the joint as shown in fig. 2. An ordinary tee joint is made, half the strands of the service cable being taken round one way and half the opposite way, a space being left at intervals between strands as shown.

This type of joint adapts itself to three very important points: (*a*) if good tinning is desired it is essential that the jointer should see a portion of the core of the cable which is actually being tinned; (*b*) as it is desirable to tin the underside of such a joint, it is important to make it in such a way that encouragement is given to the solder to run underneath—this can be done by having the strands arranged around the core as they are in a tee joint, so that they automatically offer a path for the metal to run down; (*c*) whilst the strands of a cable which is being "teed" on to another are wound tightly round the main cable core, it is impossible to compress the strands together as tightly as if a clamp fitting were used, hence there is much more prospect of the solder percolating through. With cables above 0.15 sq. in. it is quite a good plan to open the strands apart, and tin the core first; whilst still hot they can be squeezed back into their position before the actual tee joint is made. The next section of this type of joint to be considered is that of the middle and outer fittings. In the case of a middle and outer service joint there is no reason

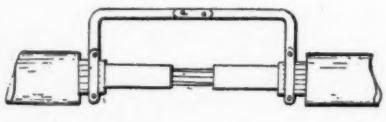


Fig. 3.—Concentric Cable-joint Fitting.

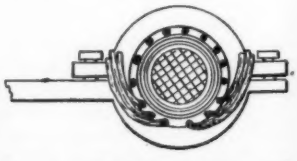


Fig. 4.—Proposed Inner and Outer Service Joint.

why the inner core of the service cable should not be teed on to the middle core of the main cable, as apart from the fact that better tinning is obtained, probably less sustained heat is required to tin than if a fitting were used. In this case, however, it is advisable not to have the solder too hot, and further, whilst a gap can be left between strands towards either end of the tee joint, it is advisable that a number of the strands should be close together, so that the hot solder can be poured in the centre of the joint on to these strands rather than directly on to the main cable strands and paper insulation. This will slightly cool the solder and prevent any concentrated heat being directly applied to the paper insulation, as the metal will gradually run all over the joint.

Where an inner and outer service joint has to be made, fittings become necessary, and it is here that a great weakness showed up in practically every service joint of this type which was examined. A common type of fitting with this arrangement is shown in fig. 3. However, it is practically impossible for a jointer to tin the bottom strands of the cable properly. A very simple rearrangement of method of making the joint can, however, improve things considerably, as shown in fig. 4. In this arrangement half a dozen of the bottom strands are swept up alongside the fitting, three on either side. It is advisable for the ferrule, which is usually slipped under the strands before the fitting is clamped in position, to protrude a quarter of an inch as shown in the figure; the strands can then be brought out by $\frac{1}{8}$ in. Further, it is advisable that this ferrule should be made of copper, as it has to be split and opened out to enable it to be placed in position, and owing to the fact that it should be tinned on the outside before being put into place, brass is apt to become brittle and crack in half; in addition to this it is advisable to have all fittings equipped with steel screws rather than brass, as the latter are liable to break when the fitting expands with the heat due to soldering. This arrangement thus complies with two of the important points (*a*) and (*b*) previously mentioned, namely, the jointer can see the strands of the cable he is tinning, and further, the strands offer a path for the molten solder to run down, a most satisfactory joint being the result.

In figs. 5 and 8 suggested dimensions are given for concentric and triple-concentric service fittings where distributor has to be bridged and the neutral outer is at earth potential. These fittings are suitable for live

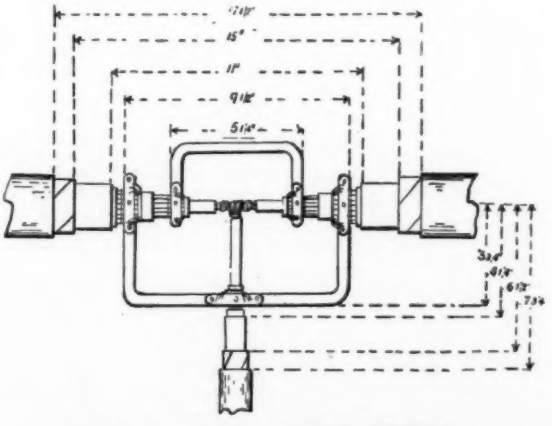


Fig. 5.—Triple-concentric Fittings.

work; they also give ample room for bridging. In fig. 5 it should be noted how strands are brought out beyond the fittings, the ferrule protruding $\frac{1}{4}$ in. at either side of the fitting. Whilst fig. 6 gives details of a suitable sealing arrangement for a compound sealed box, it will be noticed that there is a double seal and that the jute and armour are brought well into the outer pocket. This is a precaution in case the lead sheath is accidentally cut when the armour is taken off the cable. The box should have a domed lid with two filling holes, and a flanged lead gland which fits tightly on the cable lead. The outer pocket can be used for lead pouring if it is desired to bond cable lead; a lid must then be fitted to prevent molten lead being poured direct on the cable lead. Brass set-screws should be screwed into the side of the pocket, so that they protrude inside and molten lead makes contact properly.

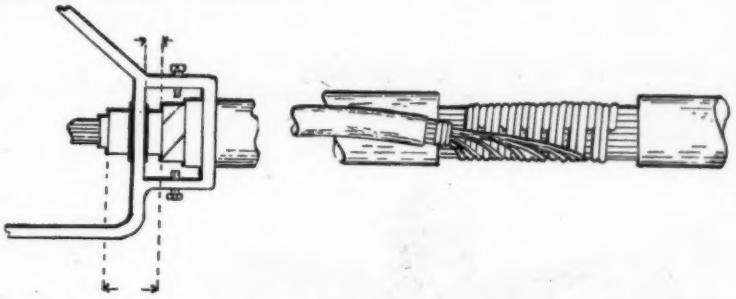


Fig. 6.—Compound-sealed Pocket. Fig. 7.—A Plumbed Service Joint.

The Plumbed Service Joint for Cored Cables.—For cored cables, probably the most popular type of joint in use in this country to-day is the "Y" joint, sometimes known as the "breeches" joint. This joint has a large number of advantages over other types: small space required; lower cost; elimination of pull on the distributor if the service cable is moved, owing to the design and method adopted for jointing it, and the way it is brought out from the sleeve.

The method of jointing the service cable to the distributor cable is important, and fig. 7 shows the type of joint which the author considers to be the best. It will be noticed that each strand of the service cable is bound round the core of the distributor about two and a half turns, and finished off before another strand is started. The object of adopting this arrangement is to ensure that spaces will automatically be left, so that the core of the distributor is regularly exposed, with the result that the solder percolates through.

In the ordinary "Y" type of joint with all the strands close together there is always the chance of the core of the distributor not being properly tinned, whereas in the type of joint which the author suggests, however tightly the strands are wound on, spaces regularly occur which ensure good tinning.

In addition to the advantages mentioned above for the plumbed service joint for cored cables, it might be mentioned that the "Y" or breeches joint lends to the adoption of very simple forms of lead sleeves which can be made up by any good plumber-jointer.

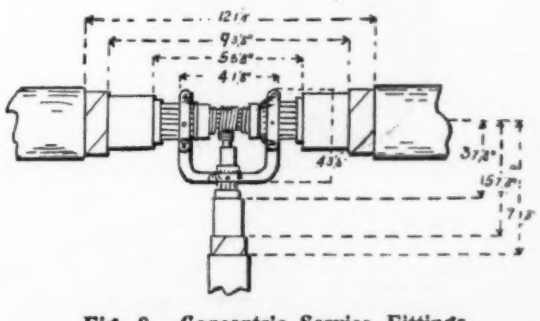


Fig. 8.—Concentric Service Fittings.

While it is often argued that such sleeves can be bought in quantity cheaper than it is possible to make them, this advantage becomes of lesser importance when the work is regarded as a convenient wet-day job, &c., or as fill-up work for the always difficult odd hours at the end of "light" days.

(To be continued.)

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

A New Street-lighting Fitting.

The Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton, has recently produced a new street-lighting fitting for which is claimed greatly increased illumination without increase in consumption. This "Nigeria" fitting, fig. 1, is a

Fig. 1.—"Nigeria" Street-lighting Fitting.

robust structure of cast-iron, consisting of a dome with a cast-iron sleeve attached which facilitates easy wiring. The sleeve is made in various lengths, each to suit one particular wattage lamp, and so fixes the filament position correctly. The reflector, the specially shaped surface of which is vitreous-enamelled, is a very particular feature, the enamel being of a brilliant mirror finish obtained by the employment of a special quality white porcelain enamel which has the appearance of silvered glass when illuminated. It has a very low percentage of absorption, and maintains its efficiency over a long period, requiring no more attention after installation than a wipe over occasionally. The fitting is designed to illuminate longitudinally a rectangular area 12 times longer and 2½ times wider than the mounting height when situated at the side of the road. A recent test demonstrated, it is claimed, that one of these fittings will replace three of the usual type of well-glass fittings without loss of essential illumination on the roadway, both types using identical g.f. lamps.

A Phase-Rotation Indicator.

A recent addition to the range of testing instruments manufactured by Messrs. Ferranti Ltd., Hollinwood, Lancs., is a

Fig. 2.—A Phase-rotation Indicator.

phase-rotation indicator, fig. 2, a very useful portable instrument for workshop or outside testing use, which is fitted with leads terminating in clips to facilitate its rapid connection to the circuit to be tested. It consists of a miniature 3-phase induction motor, the disk of which rotates in a direction corresponding to the phase rotation of the circuit to which the instrument is connected. The instrument leads are coloured red, yellow, and blue, and an arrow on the disk indicates the direction of disk rotation—counter clockwise when the instrument is connected to a circuit having the B.S.S. sequence of phase rotation of red, yellow, blue. The pressure range is 40-500 volts, and the frequency range 20-100 cycles. The instrument case is 2¾ in. in diameter and is of black moulded insulating material. The complete indicator, which weighs only 8 oz., is supplied in a leatherette case which can be carried conveniently in the pocket.

A New Fan-Cooled Motor.

The Century Electric Co., of St. Louis, Mo., has recently developed a new "Century" totally-enclosed fan-cooled squirrel-cage induction motor, fig. 3, which, in most of the ratings, has the size advantages of a standard open-rated motor, plus the added advantage of full protection to the stator, rotor, and other internal parts, all of which are completely isolated from the outside air. This effectively prevents the entrance of dust and dirt.

The motor is completely enclosed, with ribbed cast-iron coil guards, and there are no rubbing seals or air gaps.

The fan and fan housing are externally mounted on the front end of the motor opposite the pulley end. The cooling air is drawn in at the pulley end, circulated around and over the rear coil guard, through the air passages between the field

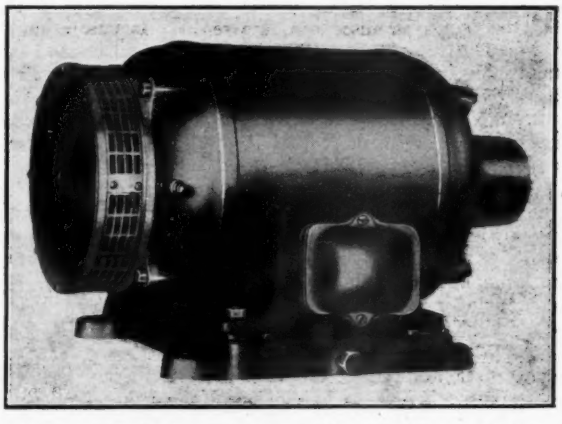


Fig. 3.—The New "Century" Fan-Cooled Motor.

core and the frame, out over the coil guard on the front end, and discharged into the air through the fan and fan housing. The air passages are unobstructed and allow free passage of the cooling air. The fan blades are radial, so that the cooling system is equally effective in either direction.

A Small Battery Charger.

Messrs. Runbaken Motor and Electrical Accessories, Ltd., Magneto Works, Ardwick, Manchester, have introduced the Ardwick No. 1 battery charger for a.c. or d.c. supplies. It is designed for use in small garages and radio charging stations, and will, it is claimed, run continuously day and night without attention other than occasional lubrication; no skill is required to operate it. The commutator is of unusually large dimensions, and the brushes are self-regulating and adjusting. The armature is carefully balanced and mounted on self-lubricating ball-bearings. The complete outfit consists of a generator and switchboard combined with overall dimensions of 18½ in. by 9 in. by 8½ in. It is supplied for alternating current at 50, 60 or 100 cycles, and 100/250 volts, and for direct current at 100 to 250 volts. It is claimed that the machine will charge 7 six-volt accumulators in 8 or 9 hours.

A Novel Pocket Lamp.

Messrs. Everlite, Ltd., Metropole House, Finsbury Square, E.C.2, have recently introduced a novel electric pocket lamp which is said to contain no dry battery, accumulator, switch, or moving part of any kind. It is turned "on" and "off" by a turn to one side or the other, and all that is necessary, it is claimed, to produce consistent white light for at least eight hours is a small inexpensive refill and ordinary tap water.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

The B.E.A.M.A. Annual Meeting.

The annual meeting of the British Electrical and Allied Manufacturers' Association was held at the offices of the Association, Kingsway, W.C.2, on March 20th. Lieut.-Col. R. K. Morcom, C.B.E. (Belliss & Morcom, Ltd.) presided, both the chairman (Mr. V. Watlington) and the director (Mr. D. N. Dunlop, O.B.E.) being absent owing to illness. Before moving the adoption of the report, which is abstracted on p. 605 of this issue, the chairman referred to the great loss which the Association had sustained during the year by the death of Dr. S. Z. de Ferranti, and the regrettable retirement from the Council of one of its oldest members, Mr. F. H. Nalder. Referring to the report, the chairman said that severe compression had had to be exercised; a large volume would not contain a full account of the general activities of the Association during the year. Perhaps the most striking feature of the report was the indication it contained of the excellent position which the Association occupied in the opinion of the best judges. Their valuable statistical department had brought the Association more into the public eye. They could also feel some pride in their happy relations with Government departments and with other associations. Mr. M. J. Railing (General Electric Co., Ltd.) seconded, and after discussion, the report was unanimously adopted. The chairman announced that the following companies had been elected members of the Council: The British Electric Transformer Co., Ltd., the Metropolitan-Vickers Electrical Co., Ltd., the Micanite & Insulators Co., Ltd., Nalder Brothers & Thompson, Ltd., and Allen West & Co., Ltd.

Polish Electrification Syndicate.

A further step in connection with the schemes for the electrification of Poland is reported to have been made, by the formation of a combination under the title of the "Polish Electrification Syndicate," which appears to be a countermove to the project put forward by the Harriman group. The promoters include the Union des Mines, Paris, the Banque de l'Union Parisienne, Paris, the Blair Corporation, New York, Hambros Bank, London, the Union Financière Electrique, Paris, the Compagnie d'Electricité, Paris, and the Compagnie d'Electricité, Brussels. Represented in the syndicate are said to be almost all the coal mines which are outside the sphere of influence of the Harriman group, including the State-controlled Sosnowice mine.

Electrical Organisation in Czecho-Slovakia.

It is reported from Brussels that the Union Financière d'Electricité et de Transport of that city, and the Ver. Electricitäts Gesellschaft, of Vienna, are in negotiation for the formation of a concern under the title Société d'Electricité et de Transport de l'Europe Centrale, which aims at the concentration and rationalisation of the electricity supply industry in Czecho-Slovakia. The capital of the new company is put at 100 million francs and at the commencement it is to be solely concerned with financial matters. The activity of the company would also extend beyond the country mentioned.

Wages in the Engineering Industry.

At the last meeting between representatives of the engineering trade unions and the Engineering and Allied Employers' Federation, to discuss the men's request for higher wages, the employers suggested that the unions should join with the Federation in an investigation of wages and conditions in the Continental engineering industry. This proposal was considered at a joint meeting of the executive committees of the trade unions last week, when it was decided not to agree to it. Alternatively, the unions decided to ask the Government to set up an inquiry into wages and conditions in the engineering industry.

As we reported last week, the Electrical Trades Union is not satisfied with the course of the negotiations with the employers and has announced its intention of taking separate action.

Wages in the Cable-making Industry.

The Joint Industrial Council for the Electrical Cable-Making Industry notifies us that there will be no "cost-of-living" alteration in wages on the third pay-day in April.

The Easter Holidays.

The ELECTRICAL REVIEW for April 18th will be published on the morning of April 17th owing to the following day being Good Friday. Our advertisement department announces that it will require new copy (with blocks) by Wednesday morning, April 9th. Official notices and small prepaid advertisements can be accepted up to 5 p.m. on Monday, April 14th.

Employment during February.

The March *Ministry of Labour Gazette* states that employment in the engineering industry during February remained bad, on the whole, and continued to decline in all sections and nearly all districts. In electrical engineering employment remained fair. The regional reports show that in London and the Southern Counties conditions in the electrical engineering industry were still good; in the Birmingham, Wolverhampton, and Coventry district employment in the industry was fair; but in Lancashire and Cheshire it was only moderate.

The total number of unemployed in the engineering industry on February 24th was 111,137, equivalent to 11.1 per cent., against 10.1 per cent. in January. In the electrical engineering branch the figure was 4,816, the percentage having risen from 5.2 to 5.7. The electric cable, wire, and lamp manufacturing group reported 6,474 unemployed, the proportion being 6.9 per cent., against 6.4 per cent. There was also an increase in unemployment in the electrical wiring and contracting industry—from 7.5 to 8.5 per cent.— the number of unemployed being 1,418.

Unemployment in Germany.

The *Ministry of Labour Gazette* publishes a note on German unemployment in January. In this it is shown that the engineering and metal group reports a trade union membership of 1,050,900. Of these 14.1 per cent. were unemployed at the end of January (as compared with 12.7 per cent. in January, 1929), while a further 16.1 per cent. (against 12.5 per cent.) were working short time.

Unemployment.

There was a further increase of 16,583 in the number of registered unemployed during the week ended March 10th. At that date the total was 1,583,800, as compared with 1,547,217 on March 3rd, and 1,268,839 on March 11th, 1929.

Buenos Aires Transport Project.

The Municipality of Buenos Aires has received an offer from a syndicate of Argentine and German capitalists to inaugurate a wide transport system, covering electric tramway and motor 'bus services, for the city and suburbs, the total estimated cost of the installation being not less than 565,000,000 paper pesos. Plans will be submitted shortly to the Municipality for approval and a joint concession asked for in favour of the Allgemeine Electricitäts Gesellschaft and the Compañia General de Obras Públicas.—*Reuter's Trade Service* (Buenos Aires).

American Domestic Appliance Exports.

The American official trade returns for the past twelve months which are now available give an idea of the growing demand in all countries for household electrical appliances. From the official figures we have compiled the appended special table showing the exports from the United States during the past two years from which it will be seen that during 1929 the trade increased by approximately 24 per cent.

	1928.	1929.	Increase.
	£	£	£
Washing machines	364,660	400,100	35,440
Vacuum cleaners	171,570	297,710	126,140
Irons	72,350	75,980	3,630
Cooking ranges	58,830	70,820	11,990
Other electric heating and cooking devices	186,300	201,540	15,240
Other electric household devices	171,570	225,790	54,220
Totals	£1,025,280	£1,271,940	£246,660

E.D.A. Sales Conference.

The season's series of E.D.A. Sales Conferences (North-West Area) was brought to a successful conclusion on March 19th at the Manchester Lighting Service Bureau. A short talk was followed by four E.D.A. films entitled "The Perfect Servant who Rules the World"; "Where the Money Goes"; "Country Currents"; and "History of Electricity."

Siemens Cable for Sydney.

Trade with the Dominions is a subject which, at the moment, is receiving a good deal of attention, and it is pleasing therefore, to see that a large consignment of cable has been shipped

Loading Siemens Cable for Sydney.

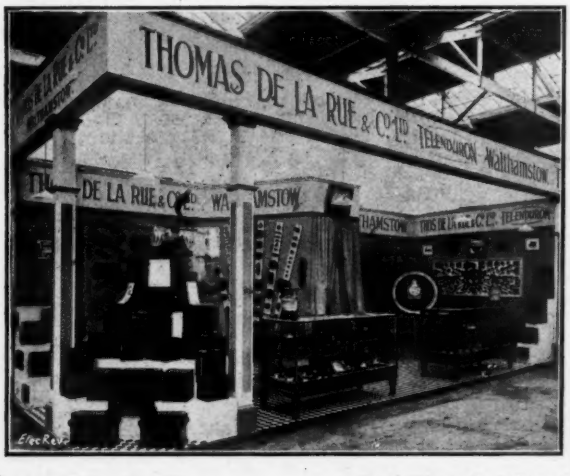
by Messrs. Siemens Bros. & Co., Ltd., to Sydney Municipality. The accompanying illustration shows barges being loaded at the company's Woolwich wharf with drums containing 33,000-V power cable.

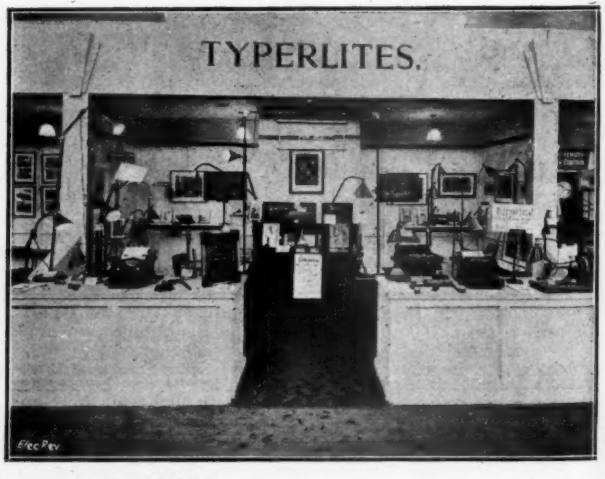
Indian Electrical Imports.

In our issue of August 2nd last (p. 209) we published statistics of electrical imports into India during the fiscal year 1928-29. More detailed figures have now come to hand and any of our readers who desire further information regarding the trade are invited to consult these figures at our offices.

Displays at Two Recent Exhibitions.

We reproduce, herewith, illustrations of displays at two recent exhibitions. The feature of the display of Messrs. Thos. de la Rue & Co., Ltd., at the British Industries Fair, Birmingham, was "Telenduron" insulating material in a variety of forms. Many examples of electrical and radio components were also shown. The display of the "Typerlite" Co., at the Business Efficiency Exhibition, included a large and varied selection of all forms of "Typerlite" fittings for offices, factories, garages, &c.





Two Electrical Stands at Recent Exhibitions.

F.B.I. Contract Conditions.

The Federation of British Industries has issued a series of standard fundamental clauses which will apply to all contracts of a general nature and are recommended to members for their use. These clauses relate to arbitration, delays—extension of time, damages for delay, insurance, and general liability of the contractor.

Swedish Activities in Jugo-Slavia.

It is reported from Vienna that Swedish electrical interests are obtaining a firm footing in Jugo-Slavia. Last year the Allmänna Svenska Elektriska A.B. acquired the central station in Semlin, one of Belgrade's suburbs on the other side of the river Save. Now the Swedish concern's subsidiary company, the A.B. Electro-Invest, has bought one of the largest electricity works in Jugo-Slavia, namely, the central station in Pancsowa, the sister town of Belgrade, on the other side of the Danube. In this way the Swedish concern will ensure itself a dominating position in a specially fertile district of the Banat between the Danube and the Theiss rivers, which Hungary had to cede to Jugo-Slavia. Negotiations are said to be proceeding with a view to the purchase of a number of other electricity works in other towns around Belgrade. The idea is that the Swedish company will obtain the contract for the electrification of the whole of this region. The Pancsowa power station has hitherto been owned by a Berlin company, and the purchase price is said to be about 1,500,000 kr.

Works Councils.

Mr. Mander, supported by a number of other Liberal Members of Parliament, has introduced a Bill providing that the establishment of works councils shall be compulsory in factories or workshops in which 50 or more persons are employed. The functions of these councils would be to act in a consultative capacity with regard to "various matters of mutual concern to employers and employed persons, and for other purposes related thereto." Among the matters specifically mentioned in the Bill are the dismissal of employés for misconduct and inefficiency, and the suspension of employés on the ground of shortage of work.

America and the Australian Tariff.

A note in the March issue of *Anglo-American Trade* (the organ of the American Chamber of Commerce in London) says that "the additional tariff schedule issued recently by the Australian Government particularly affects American trade in electrical equipment and machinery on which the duties have been increased to 75 per cent. from 50 per cent."

Lamp Manufacturing in Poland.

Electric lamps are now being manufactured by four concerns in Poland—the Polish branch of the Philips Co., in Warsaw; the Osram Co., at Pabjanice; the United Incandescent Lamp Co., Lemberg and the Zarag Co., of Lemberg. The output amounted in 1928 to about 6 million lamps, as against an estimated annual requirement in Poland of between 9 and 10 millions.

Local Exhibition.

An exhibition arranged by Electrical Distribution of Yorkshire, Ltd., was held at the Temperance Institute, Thorne, from March 13th-20th. Great interest was taken in the exhibition and many inquiries were received as a result of the demonstrations of electrical cooking, &c., which were given daily. There is every prospect of considerable electrical development in this thriving colliery township.

Recent Contracts.

The Westinghouse Brake & Saxby Signal Co., Ltd., has received an order from the London Midland & Scottish Railway Co. for the supply and installation of a complete power signalling plant at St. Enochs Station, Glasgow. The following material is included in this contract: One 227-lever all-electric interlocking frame; an illuminated diagram; 53 main three-aspect colour light signals with posts, ladders, fittings, &c.; 99 shunt and call-on signals; 26 route indicators; 106

power-operated point layouts; 128 a.c. condenser-fed track circuits; and about 450 a.c. relays.

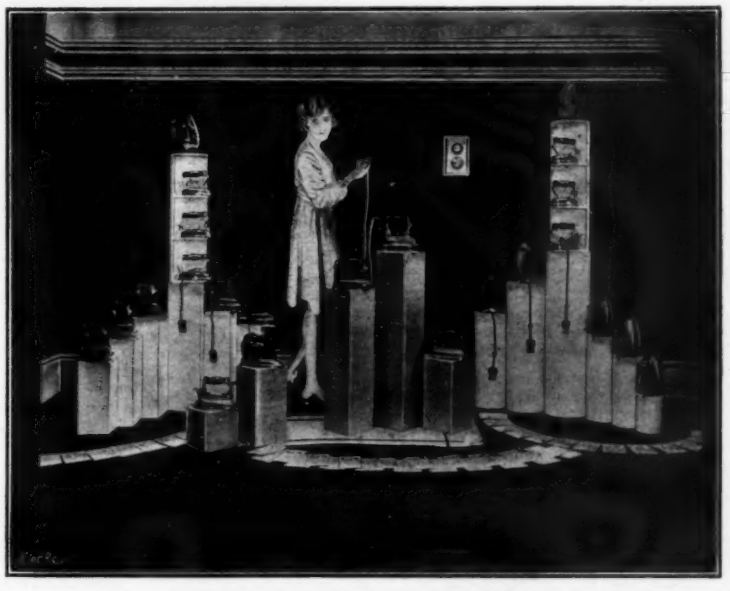
The contract for a new passenger liner has been placed within the last few days by Messrs. Furness, Withy & Co., Ltd., of London, with Messrs. VICKERS-ARMSTRONGS, LTD. The liner, which will be of about 23,000 gross tons, is intended for the New York-Bermuda service and will be electrically propelled. The whole of the electrical machinery and control gear is being manufactured by the GENERAL ELECTRIC CO., LTD., the turbo-alternators which will supply the power to the propulsion motor and for auxiliary purposes being of G.E.C.-Fraser and Chalmers construction.

Messrs. RUSTON & HORNSBY, LTD., have received an order from the Manchester Corporation for three six-cylinder vertical oil engines, each of 360 b.h.p., for generating electricity in connection with the waterworks undertaking on the Haweswater site. The engines work on the "Ruston" airless injection system, and they are of the totally-enclosed forced lubrication type.

Amongst recent orders received by the UNDERFEED STOKER CO., LTD., are the complete ash-sluicing plants for the London Power Co. (Battersea power station); Ipswich Corporation; Shropshire, Worcestershire and Staffordshire Electric Power Co., Ltd. (Severn power station, Stourport); and Messrs. Edward Lloyd & Co., Ltd. (Kemsley paper mills, Sittingbourne).

The GENERAL ELECTRIC CO., LTD., has received an important order from the Union Construction Co., Ltd., for electrical equipment for the new high-speed tramcars which the latter company is constructing for the Uxbridge Road services of the London United Tramways. The order comprises 94 high-speed motors of 70 h.p. on the one-hour rating, 500 V, 96 cam-type controllers, and 48 sets of line switches with overhead release. The motors are of unusually high capacity for the small diameter of driving wheel to be used, *viz.*, 28 in.

The ELECTRIC FURNACE CO., LTD., has just received an order for an "Ajax-Northrup" high-frequency furnace of 25-cwt. capacity from a French steelworks, which had previously installed two smaller furnaces of the same type. This furnace will have an output of over 1 ton per hour. This company has also recently received orders for a 3½-ton Héroult furnace for Spain, and for 64 tube heaters and 24 frame heaters for a French firm.



The E.D.A. April Window Display.

The Department of Overseas Trade.

The following information is published by the Department of Overseas Trade, 35, Old Queen Street, S.W.1:—

Mr. A. W. H. Hall, Assistant to the Senior Trade Commissioner in South Africa, who has recently made a comprehensive tour of the British Colonies in West Africa, will attend at the Department's offices from March 31st to April 3rd. British traders interested in the market may arrange appointments with Mr. Hall by communicating with the Department and quoting Reference 6989/1.

A memorandum on the appointment of agents in Egypt and the Sudan has been forwarded to the Department by the Commercial Secretary to the Residency, Egypt. Copies of this can be obtained by United Kingdom firms (Reference C.3223).

The Department states that the Commercial Counsellor at Moscow desires to receive copies of catalogues, &c., relating to commodities for which there is a potential demand in Russia. Such commodities comprise principally productive machinery for industrial and agricultural purposes. Catalogues should be addressed to: The Commercial Counsellor, British Embassy, Ulitza Voroskovo, Moscow.

The Department has received a copy of the report on the Ceylon Hydro-Electric Scheme, which was published at the Government Record Office, Colombo. This report is available for loan to British companies interested on application to the Department.

New French Company.

A company has been formed in Paris (66, Rue de la Chaussée d'Antin) with a capital of 500,000 fr. and the title La Compagnie Générale Electro-Frigorifique to manufacture electrical refrigerating equipment.

The E.D.A. April Programme.

The accompanying illustration is reproduced from the April sales and publicity programme of the British Electrical Development Association, and shows a suggested window display for the month, the necessary materials being obtainable from the Association (apart from the actual appliances). The adoption by the E.D.A. Council of the Electric Home Wiring Specification is to be accompanied by a campaign to architects and builders, and details of an intensive advertising scheme are given. "The Electric Girl," who has appeared in all E.D.A. advertisements, posters, lantern slides, &c., is now obtainable as a poster stamp for letter headings, envelopes, and accounts. With the approach of spring, the posters for the month are devoted mainly to spring cleaning, and a number of publications are available dealing with this subject. Accompanying the programme, we have received a copy of the Electric Home Wiring Specification. This comprises rules for the supply, fixing, testing, and connecting up to the supply authorities' fuses of a complete wiring installation, describing various types of wiring, and a specification of adequate wiring for medium size rooms, indicating the minimum number of points, and optional recommendations and extra points required for large rooms. A schedule of wiring and a model form of guarantee are also included. The programme contains notes by the director on the Home Wiring Specification and a list of national papers in which the Association's advertisements will appear is also given.

Bankruptcy Proceedings.

A. P. GODDARD, 25, Silver Street, Doncaster, Yorks., electrician.—The public examination herein was held on March 20th at the County Court Hall, Sheffield. According to the statement of affairs there were liabilities amounting to £272 against assets of £118. The examination was closed.

K. L. GARDNER, dealer in wireless apparatus, &c., 7, Bridge Street, Wisbech.—Receiving order made March 18th on debtor's own petition.

L. C. WARNER, wireless dealer, &c., 4, School Lane, Leominster.—Receiving order made March 17th on debtor's own petition.

E. BALL, electrical contractor, Old Hall Street, Middleton.—Receiving order made March 17th on debtor's own petition.

J. L. MCLEOD (McLeod Bros.), radio and electrical engineer, 55, Chorley New Road, Horwich.—Application for discharge to be heard April 15th at the Court House, Bolton.

A. L. ASTILL (Eastern Wireless Supply Co.), wireless engineer, 362, High Street, Lincoln.—Trustee, Mr. F. C. Brogden, Official Receiver, 10, Bank Street, Lincoln, released March 10th.

D. C. BATE, electrical manufacturer and supplier, 16, John Dalton Street, Manchester.—Trustee, Mr. J. F. Warburton, 28, Queen Street, Manchester, released March 3rd.

J. HOBSON, electrical engineer, 1a, Thornecliffe Grove, Whitworth Park, Manchester, and Cross Street, Pendleton, Salford.—Last day for proofs for dividend, April 5th. Trustee: Mr. F. Murgatroyd, Official Receiver, Byrom Street, Manchester.

H. PEOVER, electrical apparatus and tool merchant, Market Lane, Newcastle-on-Tyne.—First and final dividend of 1s. 11d. in the £, payable at the Official Receiver's office, 81, St. Mary's Place, Newcastle-on-Tyne.

Company Liquidations.

STAFFORDSHIRE ELECTRICAL ACCESSORIES CO., LTD., Lichfield Street, Hanley.—The statutory meeting of creditors was held recently at Hanley, when a statement of affairs was submitted showing ranking liabilities of £1,262 all due to unsecured creditors. The assets were estimated to realise £1,007, and they were subject to preferential claims of £85, and debentures totalling £1,462. The assets were insufficient to pay off the debentures in full, and consequently there were no assets available for the unsecured creditors. The deficiency as regarded the debentures was £539. The issued capital of the company was £4,502, and the deficiency as regarded the shareholders was £6,303. The company was formed in 1919 to take over

an existing business. Shares to the value of £2,251 were issued to the vendor, and further shares to the value of £2,251 were allotted for cash. The debentures were issued in March, 1920, and were subsequently transferred to the bank. In 1927 there was a profit of £39; in 1928 a profit of £8; and in 1929 a loss of £350. In consequence of a distress for rent, the bank appointed Mr. D. H. Bates, Hanley, as receiver. The voluntary liquidation of the company with Mr. Bates as liquidator was confirmed. The principal creditors are:—

	£		£
Kelvinator, Ltd. ...	133	Davies Insulating Co.	145
General Electric Co., Ltd.	64	H. W. Teeton, Ltd. ...	103
British Thomson-Houston Co., Ltd.	95	D. H. Bates & Co.	72
		Credenda Conduit Co., Ltd.	44

Standard Electric Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. Johnston, 190, West George Street, Glasgow.

Cook's Wireless Co., Ltd.—A meeting of creditors was held on March 24th at the London & North-Eastern Railway Hotel, Liverpool Street, E.C.

Ideal Wireless Co., Ltd.—Liquidator, Mr. H. J. Eldridge, 133, Moorgate, E.C., appointed February 13th.

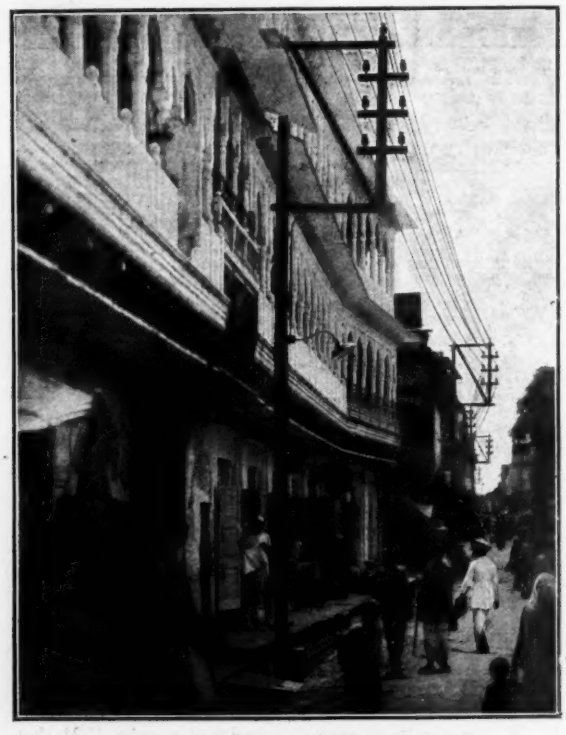
Dissolutions of Partnership.

J. Batty & Co., electrical and wireless engineers, 9, Fleet Street, Burnley.—Mr. T. Dawson and Mr. G. Berry have dissolved partnership. Mr. Dawson will attend to debts and continue the business under the style of J. Batty & Co.

Wholesale Electro Supply Stores, merchants and factors, of electrical accessories and appliances, Lower George Yard and 10, Gaol Lane, Halifax.—Mr. A. Buckley and Mr. C. Vowles have dissolved partnership. Mr. Buckley will attend to debts.

Henley's in India.

The accompanying illustration depicts the Kotah main bazaar, Kotah State, India, with "Henley" l.p. house-service and street-lighting mains showing rather prominently. This formed part of a contract which W. T. Henley's Telegraph Works Co., Ltd., has recently completed, comprising the



Henley Cables in an Indian Bazaar.

supply and installation of h.p. and l.p. underground feeder cables and overhead feeders, l.p. distributors and street-lighting fittings. The system is 3,300/400 V, three-phase, 50 cycles. High-tensile weldless tubular steel poles manufactured by the British Mannesman Tube Co. were used exclusively.

Winding-up Petitions.

Foundation Co., Ltd.—A petition has been presented to the High Court for the winding up of the above-named company by Mr. L. C. Peppiatt, creditor, and will be heard in London on March 31st.

Celebritone, Ltd.—A petition has been presented to the High Court for the winding up of the above named company by Philips Lamps, Ltd., 145, Charing Cross Road, W.C., and will be heard in London on March 31st.

Transformers for the Central Electricity Board.

The British Electric Transformer Co., Ltd., which has received from the Central Electricity Board an order for transformers for the "grid" with an aggregate capacity of

A B.E.T. Transformer for the Grid.

1,600,000 kVA, recently dispatched one of these from its works to Hornsey. The unit in question weighed 42 tons, and the size of the load was such that it was only possible for it to travel by night. Careful driving was essential as the load only cleared the lowest railway bridge on the route by 2¼ in. The transformer is shown in the accompanying illustration.

Book Notices.

"The Home Electrician," Part 3, Lamps and Illumination. By T. M. F. Tamblyn-Watts, A.M.I.E.E. Pp. 64; figs. 40. This is the third part of a useful work in which the author is making a creditable attempt to popularise electricity for domestic purposes.

"Industrial & General Administration," by H. Fayol. Pp. 84. London: Sir Isaac Pitman & Sons. Price 3s. 6d. net.

Trade Announcements.

The Young Accumulator Co. (1929), Ltd., informs us that it has obtained a licence and has installed machinery for the manufacture of the Wilderman porous rubber separator. Some particulars of this were given in our issue of February 4th, 1927 (p. 182).

The British Home and Office Telephone Co., Ltd., has removed to new and larger premises at Minster House, 272-4, Vauxhall Bridge Road, Victoria, S.W.1. (Telephone Nos. 7043-7044; Telegrams, Phonoco, Churton, London.)

Mr. L. M. Waterhouse has removed to new premises at High Holborn House, Bedford Row, and 52-54, High Holborn, W.C.1. (Telephone: Chancery 7087-7088. Telegrams: Wenhahouse, Holb., London.)

The London office of the United Steel Companies, Ltd., and associated companies, is now at 16, George Street, Westminster, S.W.1. The telephone numbers and telegraphic address are unaltered.

Messrs. Edgar Oates, Ltd., electricians, Oldham, have removed their business to larger premises at 17, Clegg Street.

The Henry Wells Oil Co., Ltd., have moved from 11, Haymarket, S.W.1, to large premises at 736-739, Salisbury House, Finsbury Circus, E.C.2. (Telephone: Metropolitan 4283.)

Mr. J. S. Plumtree has moved from 90/91, High Holborn, to 11 and 12, Sicilian House, Sicilian Avenue, Southampton Row, W.C.1. (Telephone: Holborn 1941.)

Messrs. Victor X-Ray Corporation, Ltd., have removed to larger premises at 15, 17, 19, Cavendish Place, W.1. (Telephone: Langham 3043 and 3044.)

Social Events.

The G.E.C. Choral Society's season culminated with a concert at Magnet House, Kingsway, W.C.2, on Friday, March 14th, which was the most successful it has so far given. The main programme consisted of two works particularly suitable for choral production; first, the well-known "Hiawatha's Wedding Feast," and second, the more unusual "Deacon's Masterpiece," the words of which are by Oliver Wendell Holmes set to music by Percy E. Fletcher. The rendering of these two works was extremely effective, and evidenced weeks of serious practice under the able leadership of Mr. Sack. The remainder of the programme consisted of solos, duets, quartettes, &c. The programme was enthusiastically received by the largest audience before which the Choral Society has yet performed.

The G.E.C. eleventh annual sports and gala will be held at the company's London Sports Ground, Preston Road, Wembley, on July 5th.

On the invitation of the directors, the employés of A. P. Lundberg & Sons, Ltd., Liverpool Road, N.7, took part in a social evening at Rawdon Hall, Holloway, N., on March 15th.

After refreshments, a varied programme was thoroughly enjoyed by all present, community singing proving a great success.

The staff of the Bingley Urban District Council Electricity Department held its annual dinner last week at the Fleece Hotel, Mr. P. Clegg (manager) presiding. A toast to the Department was proposed by Captain A. W. Brown, a member of Bradford City Council, and responded to by Mr. W. M. Whitwham, chairman of the Bingley District Council. Councillor W. Longbottom, deputy-chairman of the Lighting Committee, proposed a toast to the visitors, to which Mr. B. C. Johnson (Manchester) responded.

The second dinner of the Association of Ex-Siemens' Men was held on March 20th, at Gatti's Restaurant, King William Street, W.C., Mr. G. Palgrave Simpson presiding. Reference was made during the evening to the spirit of comradeship that kept the old members of the Siemens' organisations together. Mr. J. Snow Huddleston was re-elected honorary treasurer and secretary of the Association for the ensuing year.

For Sale.

Messrs. Weatherall & Green will sell by auction at the London Auction Mart, 155, Queen Victoria Street, E.C.4, on May 13th, H.M. Stratton factory, Swindon, including electrical plant and machinery.

The St. James' and Pall Mall Electric Light Co., Ltd., invites offers for approximately 500 d.c. meters.

Electricity Distribution of North Wales and District, Ltd., have for disposal two crude oil engines and three alternators, complete with accessories. (See our advertisement pages to-day.)

New Catalogues and Lists.

FURSE WHOLESALE, LTD., Traffic Street, Nottingham.—Price list No. 25/30 of electrical apparatus and appliances.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Leaflet No. 40/1-4, being a reprint of two articles by Mr. L. H. A. Carr on induction motors; also leaflet No. 39/1-1 describing a new line of flameproof induction motors. Illustrated.

Messrs. GENT & Co., LTD., Faraday Works, Leicester.—Book 7, section 8, illustrated and priced, dealing with bell signals, relays, keys, &c., for fiery mines, &c.

Messrs. SIEMENS BROS. & Co., LTD., Woolwich, S.E.18.—Price Sheet No. 649, drawing attention to the company's new "Full-o'-Power" radio battery.

TRELLEBORG'S EBONITE WORKS, LTD., Union Place, Wells Street, W.1.—A price list of the company's ebonite panels, strips, sheet, rod, tube, and lead-in-tubes.

Messrs. T. C. JONES & Co., LTD., 93-95, Wood Lane, W.12.—An illustrated and priced catalogue of road contractors' tools and equipment.

KORTING & MATHIESEN ELECTRICAL, LTD., 711 and 715, Fulham Road, S.W.6.—Lists Nos. 1228a, D17130, and F1928a, dealing, respectively, with "Kandem" floodlight projectors, domestic fittings, and reflector fittings for industrial lighting. Illustrated and priced.

Messrs. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester.—A leaflet advertising the "Goltone" no-mast aerial.

ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Illustrated publications Nos. K.71 and K.81, dealing, respectively, with metal-clad switchgear and variable-speed a.c. commutator motors.

CREDENDA CONDUITS CO., LTD., Oldbury, near Birmingham.—Two leaflets (Nos. 104/2/30 and C103/2/30), referring respectively to the company's electric tubular heaters, and its conduit bender. Illustrated.

WARDLE ENGINEERING CO., LTD., Elsinore Road, Old Trafford, Manchester.—A comprehensive catalogue (pp. 88) containing illustrations, dimensions, &c., of street-lighting fittings, accessories, combined time switch and fuse boxes, &c. An abstract from the B.E.S.A. specification for street lighting, No. 307, is included.

Messrs. BARRETT & ELERS, LTD., Dace Road, Old Ford, E.3.—A catalogue illustrating the many applications of "Belleroid" mouldings. Priced.

Messrs. FALK, STADELMANN & Co., LTD., 83-93, Farringdon Road, E.C.1.—A showcard advertising the "Efesca" electric suction cleaner, illustrating, above the slogan "Clean Your Home the 'Efesca' Way," a lady holding a vacuum cleaner.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—A folder referring to "B.I." aerial cable unions for steel-cored aluminium conductors.

Mr. ALAN WRIGHT, 117, Victoria Street, S.W.1.—An illustrated and priced leaflet drawing attention to the new H.H. star-delta starter, type 54.

JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—A leaflet drawing attention to the Jackson "Junior" cooker which is now obtainable in two sizes.

Messrs. CROMPTON PARKINSON, LTD., Chelmsford.—An illustrated and descriptive leaflet of the "Alltest" instrument for all d.c. tests.

Prices of Materials.

Messrs. F. Smith & Co. and Messrs. James & Shakespeare report March 25th: No change in copper prices.

Messrs. F. Smith & Co. report March 25th: English pig lead £20 10s., 10s. increase.

Messrs. Edward Till & Co. report March 25th: India-rubber, Para fine, 8¾d., ¼d. increase.

Reporting on March 22nd, Messrs. James Forster & Co. stated that the lead market was subject to control during last week, and prices showed little change from day to day. A fair demand from consumers was experienced, the steadier tone in the market having restored confidence to a certain extent. Producers met the demand freely. A considerable amount of buying was also seen in the market but, as this was probably to a large extent for speculative account (encouraged by the better tone in other metals), this will only mean weakness later on when the lead has to be re-sold, unless in the meantime a substantially better demand develops in this country and on the Continent. Supplies still exceed demand and, in Messrs. Forster's opinion, only a cut in production will rectify the situation. Failing this, prices will ultimately fall to a level at which high-cost producers will be forced to curtail output.

Lighting and Power Notes.

Aberdeen.—EXTENSION OF SUPPLY AREA.—The Town Council has confirmed a recommendation of the Electricity Committee for the extension of the Corporation's area of supply of electricity to the parishes of Banchory-Devenick and Maryculter, in Kincardineshire.

REFUSE DISPOSAL PLANT.—The Town Council has also agreed to the erection of a separation plant capable of dealing with 60 tons of refuse per day, the cost of this plant, including buildings, screening plant, incinerators, &c., being estimated at £10,000. It is proposed to erect a one-unit plant and to add a second unit if and when required.

Accrington.—CHANGE-OVER.—The Corporation Electricity Committee has received sanction to the borrowing of £33,174 in connection with the change-over from d.c. to a.c.

Ashbourne.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Urban District Council to supply electricity in the urban district of Ashbourne and in parts of the rural districts of Ashbourne and Mayfield.

Ashton-under-Lyne.—LOAN.—Application is to be made by the Town Council for sanction to the borrowing of £41,314 for the following purposes:—Reconstruction of railway sidings and coal conveyor, £4,540; ash conveyor and ash hopper, £5,250; additional accommodation for outdoor work, £6,100; new general offices, showrooms, sub-station, and cooker department, £25,424.

Aylesbury.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £8,274 for mains, £520 for sub-station equipment, and £1,500 for transformers and switchgear.

Barnes.—BULK SUPPLY.—In consequence of the refusal of the Electricity Commissioners to consent to the extension of the generating station, the Urban District Council is to take a bulk supply from the London and Home Counties Joint Electricity Authority at a cost of £3 2s. 6d. per kW, plus 0.14d. per kWh.

Bedford.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £1,800.

Bexhill-on-Sea.—NEW PLANT AND CABLES.—The Corporation Electricity Committee has decided upon the provision of plant, &c., and the replacement of distributor cables at a cost of £7,420. The Committee has received sanction to the borrowing of £6,117 for plant extensions at the Northern sub-station.

Buxton.—REVISION OF ELECTRICITY TARIFFS.—The Corporation Electricity Committee has decided to make the following alterations in the charges for electricity as from the March meter readings:—Lighting flat rate: First 100 kWh per quarter, 6d. per kWh; next 1,000, 5d.; above 1,100, 4d. Two-rate system (by two-dial meter): Restricted hours graded from 4 p.m. in mid-winter to 8 p.m. in mid-summer—until 12 midnight, as above; after midnight, 2½d. per kWh. Late shop-window lighting and outside signs: 2½d. per kWh. "All-in tariff": Fixed charge of 15 per cent. of ratable value, with minimum of £3 per annum, plus ¾d. per kWh consumed.

Carlisle.—UNEMPLOYMENT SCHEME.—The Corporation Electricity Committee has received sanction to the borrowing of £13,000 for the extension of mains as an approved unemployment relief scheme.

Continental.—SWEDEN.—The Government has put forward a proposal for the construction at a cost of Kr. 9,800,000 of a new Government-owned hydro-electric power station on the Motala river where one Government-owned and two private hydro-electric power stations are now in operation. The Minister of Communications suggests that the Government should buy the private stations in order to establish intimate collaboration between the four stations.—*Reuter's Trade Service* (Stockholm).

Preparations are being made to increase the capacity of the Hammarforsen power station from 20,000 to 40,000 h.p. This station supplies power to the towns of Sundsvall and Hernoesand and the neighbouring industrial districts.—*Reuter's Trade Service* (Stockholm).

MORAVIA.—The Brown-Boveri Co., of Baden, Switzerland, has recently completed a 36,000-kW turbo-generator set for the electric power station of the Witkovitz collieries in Moravia. The turbine is of the three-stage type and is directly connected to a 3,000-r.p.m. generator.

GERMANY.—According to the *E.T.Z.*, the output of the 122 principal electric power stations in Germany during December last amounted to 1,585,600,000 kWh, bringing the total for the whole of the past year to 16,913,400,000 kWh as compared with 14,370,300,000 kWh in 1928.

ITALY.—La Società Elettrica Bresciana has recently secured a concession to establish a hydro-electric station to utilise the power of the River Idro near the village of that name in the province of Brescia. It is estimated that 22,800 h.p. is available.

Coventry.—LOAN.—The Corporation Electricity Committee is to apply for sanction to the borrowing of £16,051 for new mains and equipment.

Glasgow.—PROGRESS DURING FEBRUARY.—Under the Corporation Electricity Department's scheme, 801 houses were wired in February, making the total to date 21,096, while the appliances hired out numbered 124, bringing the total to 20,237.

MAINS EXTENSIONS.—The Corporation Electricity Committee recommends the laying of distributing mains at an estimated cost of £2,116.

Halifax.—SUPPLY MAINS EXTENSIONS.—The Town Council has approved service extensions estimated to cost £30,564. Transmission lines will be extended to Ovenden, Northowram, Illingworth, Bradshaw, Southowram, the area between Southowram and Siddal, and a traction sub-station erected at Salterhebble. The Electricity Committee has also approved a scheme for giving a supply to Copley. The work will subsequently involve a wide extension of the recently-arranged scheme, for co-operation with the local electrical contractors, for house wiring on the deferred-payment system.

Hastings.—LOANS.—The Town Council has received sanction to a loan of £6,117 for plant extensions and the northern sub-station. Application has also been made for sanction to a loan for the installation of a 220-kW Hewittic rectifier at the Little Common sub-station at an estimated cost of £1,831, and for the erection and equipment in Terminus Road of a sub-station with Hewittic rectifying plant at an estimated cost of £2,614.

Irish Free State.—THE SHANNON SCHEME.—In reply to question put by Mr. Briscoe, deputy for Dublin, in Dail Eireann on March 19th, the Minister for Industry and Commerce said that the amount paid to the contractors on the Shannon power development scheme up to date was £4,763,913.

Liverpool.—OVERHEAD LINES INQUIRY.—At a Ministry of Transport inquiry held at Liverpool on March 18th, an objection was raised by the Huyton-with-Roby Urban District Council to the erection of overhead transmission lines in connection with the Corporation's system of supply to its area. The Huyton Council sought to prevent the Liverpool Corporation erecting a multiplicity of poles and overhead lines crossing roads or, alternatively, to receive its supply by means of underground cables. It was suggested that the Corporation ought not to bear the costs of the inquiry. The Corporation was the authorised electricity undertaker for the Whiston area and could not provide a supply to that district without the permission of the Huyton-with-Roby Urban District Council.

London.—BATTERSEA.—In order to give the London Power Co., Ltd., a duplicate supply at its new Nine Elms generating station, the Borough Council Electricity Committee proposes that a second h.p. feeder be laid from the Nine Elms sub-station to the company's site, and that additional switchgear and transformers be installed at a total estimated cost of £2,367. The electrical engineer has also advised that, in view of the increased load in the Nine Elms district, an additional h.p. feeder be laid from the generating station to the Nine Elms sub-station at a cost of £8,812. As the system will shortly be connected to the Central Electricity Board's main transmission system, it is also proposed to install (*a*) two modern switches for the Nine Elms district feeders at a cost of £1,900; and (*b*) a switch for No. 3 set and two switches for the reactors at a cost of £8,880. Sanction is to be sought to the borrowing of £20,307 for plant, machinery, &c.

The Electricity Committee proposes to extend mains at a cost of £1,847.

LEWISHAM.—An experiment for comparing the relative merits of electricity and gas for street-lighting purposes has recently been carried out at Lewisham. One mile of the High Street has been illuminated by the South Metropolitan Electric Light and Power Co., Ltd., and one mile by the South Metropolitan Gas Co.

Loughborough.—EXTENSIONS.—The Town Council has decided to apply for sanction to a loan of £33,883 for mains and services, electrical apparatus for hire, and assisted wiring.

Manchester.—PROGRESS DURING JANUARY.—During the month of January the Corporation electricity undertaking showed an increase of 3,105 kW in connections, bringing the total up to 407,844 kW. The number of applications received for supply (including additional supplies) amounted to 1,199, and represented a total of 3,517 kW. The number of hired cookers connected increased by 52, making the total on circuit 5,945. Applications for the hire of cookers totalled 113. Four new sub-stations were put into commission and new plant was installed at two existing sub-stations. The change-over from d.c. to a.c. had been completed in the cases of 9,572 consumers up to February 12th, while sanction had been given and work was in progress involving 1,078 consumers.

Newcastle.—FREQUENCY STANDARDISATION.—The preparations for the standardisation of frequency at collieries were recently discussed at a meeting of the North of England branch of the National Association of Colliery Managers at Newcastle-on-Tyne. Members of the North of England Institute of Mining and Mechanical Engineers and of the Association of Mining Electrical Engineers were invited to be present; the attendance numbered over 100. Mr. George Raw, summed up the magnitude of the change over, stating that in the Northumberland and Durham collieries alone more than 6,000 motors would have to be changed, the aggregate horse-power being about 350,000. No useful purpose was to be served by minimising the formidable nature of the task. Mr. A. A. Hughes, representing the Newcastle Electric Supply Co., said the aim of his company would be to make the change with the minimum disturbance to consumers. Excepting in isolated cases, 40-cycle motors would be replaced by 50-cycle motors, and the former would be scrapped. Arrangements were being made to supply temporary plant during the change-over, so that no colliery need be idle.

New Mills.—ELECTRICITY SUPPLY.—The Urban District Council has received sanction to a loan of £24,000 in connection with a scheme for supplying electricity to the district.

Northern Ireland.—HOLYWOOD SCHEME INAUGURATED.—The Duke of Abercorn, Governor of Northern Ireland, inaugurated the electricity scheme at Holywood (Co. Down) on March 13th. The supply is conveyed from the Belfast Corporation Electricity central power station by a 22,000-V underground cable to the commencement of the Belfast-Bangor 22,000-V overhead line. A tapping is taken from this line by underground cable to the Belfast Corporation sub-station in Holywood, where the supply is stepped-down to a pressure of 6,600 V. From the Corporation sub-station it is taken by underground cable to the Holywood main distributing station in Sullivan Place. The contractors for the scheme were Messrs. Johnson and Phillips, Ltd.

Pitlochry.—INAUGURATION OF SUPPLY.—The scheme of the Grampian Electricity Co., Ltd., for the supply of electricity to Pitlochry was inaugurated on March 20th by Mr. A. Grant, district manager of the company.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

STIRLING.—Lighting, general consumers: First 2,000 kWh, 4d. per kWh; second 2,000, 3½d.; third 2,000, 3d.; beyond, 2d. Motive power: First 200 kWh, 2d. per kWh; next 800, 1d.; second 1,000, ¾d.; beyond, ½d. Heating: First 200 kWh, 2d. per kWh; next 800, 1d.; second 1,000, ¾d.; beyond, ½d.

ORMSKIRK ELECTRIC SUPPLY CO., LTD.—Lighting: From 8d. to 7d. per kWh. Power, heating, and cooking: From 3½d. to 3d. per kWh.

BATTERSEA.—Lighting flat rate: From 4d. to 3½d. per kWh. Power: From 1¾d. to 1d. per kWh. Two-part tariff for domestic supplies: The fixed charge to be reduced from 12½ to 10 per cent. of the rateable value per annum.

NORWICH.—Two-part tariff "unit" charge: From 1d. to ¾d. in Norwich and the adjoining rural parishes, and from 1¼d. to 1d. in the outer area more recently added to the Norwich distribution system.

BRIGHTON.—Power through slot meters: From 1¼d. to 1¼d. per kWh.

Southend-on-Sea.—BULK SUPPLY.—As a result of negotiations with the Central Electricity Board and the Electricity Commissioners regarding a bulk supply, the Town Council has accepted under protest the terms of the County of London Electric Supply Co., Ltd., at £5 10s. per kW, plus 0.3d. per kWh. The Corporation stated at a recent inquiry that it could generate electricity at £3 5s. per kW, plus 0.2d. per kWh. The Central Board has declined to make compensation for the difference in the costs.

Stirling.—BULK SUPPLY.—At a meeting of the Town Council held recently a letter was read from Mr. A. E. McColl, engineer for Scotland of the Central Electricity Board, stating that it was not economically possible to give a supply of 250 kW in view of the relatively large capital expenditure involved in the erection of transmission lines from the nearest grid point at Bonnybridge. Mr. McColl suggested that the Council should consider the closing down of its present power station and the taking of a bulk supply for the whole of its requirements. The Council agreed that the power station should not be closed, but, before deciding to erect a sub-station, asked that a report should be prepared on the cost of generating the additional supply itself as against the cost of taking the bulk supply from the Scottish Central Electric Power Company.

Sunderland.—LOANS SANCTIONED.—The Town Council has received sanction to the following loans: New mains and plant, £2,000; sub-station equipment, £6,530; laying of mains and erection of general electrical apparatus, £50,000; sub-

station plant and switchgear, £25,000; works in connection with the change-over necessitated by the "grid" scheme, £20,000.

United States.—HYDRO-ELECTRIC DEVELOPMENTS.—According to *Power*, the Pacific Gas & Electric Company of San Francisco has applied to the Federal Power Commission for a preliminary permit for a hydro-electric development on Bear River, Cold Creek and the North Fork of the Mokelumne River in Amador County, Calif. It is planned to install 34,000 h.p. Wallace Huntington, of Portland, has also applied for a preliminary permit in connection with a hydro-electric scheme on the McKenzie River in Linn County, Ore., where it is planned to install 44,500 h.p. to be used for public utility purposes.

Wakefield.—LOAN.—The Corporation Electricity Committee is applying for sanction to a loan of £5,000 for the provision of electric cookers and other apparatus.

Wing.—ELECTRICITY SUPPLY.—With reference to a supply of electricity to the Ivinghoe district, the Rural District Council has requested the Electricity Commissioners to agree to the Aylesbury Corporation being permitted to arrange for a supply of electricity to the parishes of Cheddington, Ivinghoe, Marsworth, and Pitstone, and that these parishes be transferred from the Luton area to the Aylesbury area.

Tramway and Railway Notes.

Bradford.—RAILLESS-CAR SERVICE INAUGURATION.—The new railless-car service between Bradford and Saltaire, *via* Thackley, will be officially opened for service to-day. The total length of the route is 6¼ miles.

Brighton.—JOINT TRANSPORT SCHEME.—After negotiations lasting for many months the Corporations of Brighton and of Hove and the owners of the local omnibus services, Messrs. Thomas Tilling, Limited, have practically agreed on a joint transport scheme to serve both towns and the surrounding areas, says the Brighton correspondent of *The Times*. The agreement will contain a provision preventing the joint transport board from substituting omnibuses for tramcars or from discontinuing any tramway services without the consent of the Brighton Corporation. It is anticipated that the scheme, which will have to be sanctioned by Parliament, will be agreed upon in detail in a few weeks.

Continental.—AUSTRIA.—The Schwarzach-St. Veit-Saalfelden section of the Austrian Federal Railways was opened to electric traction on March 13th, says *Modern Transport*. The whole of the 296 miles of line from Salzburg to Buchs (Swiss frontier) is now electrified, and the present electrification scheme of the Austrian Federal Railways is completed. Up to the present 415 miles of the Austrian Alpine railways have been equipped for electric traction.

SWEDEN.—The Government has submitted a proposal to the Riksdag for the electrification of the State Railway line Stockholm-Malmoe-Traelleborg with certain junction lines, *viz.*, Katrineholm-Aaby (40 km), Oerebro-Hallsberg-Mjoelby (220 km), Falkoeping-Naessioe (112 km), and Arloef-Lomma (5 km), in all 960 km. The Government proposes that preparatory measures be taken for this electrification work, which is estimated to cost Kr. 71,840,000. An expenditure of Kr. 16,400,000 is to be expected even if steam traffic is maintained on these lines owing to the large increase in traffic.—*Reuter's Trade Service* (Stockholm).

Glasgow.—FREQUENCY-CHANGING PLANT.—After reading correspondence between the general managers of the Electricity Department and the Transport Department, regarding the interconnectors between Pinkston and the Port Dundas power stations, the Municipal Transport Committee has asked the town clerk to take steps for the supply by the Central Electricity Board of 10,000 kW of frequency-changing plant so as to maintain the present stand-by arrangements.

Middlesbrough.—TRAMWAY ABANDONMENT.—The Middlesborough and Stockton Corporations have decided to abandon the tramway system between Middlesbrough and Norton in two years' time and to substitute for it a service of 'buses. The decision does not affect the Linthorpe route, but it involves the scrapping of half of a tramway system which originally cost the Middlesbrough Corporation £330,000.

Railless Traction.—TROLLEY 'BUS PROGRESS.—Speaking at the recent annual meeting of Guy Motors, Ltd., Wolverhampton, Mr. Sydney S. Guy, the chairman, stated that the demand for electric trolley 'buses continued to expand and, judging by the number of undertakings which were applying for Parliamentary powers to operate them, the extension of the use of this class of vehicle appeared likely to continue. In addition to contracts obtained in England two orders for initial fleets of vehicles for important undertakings in Italy and Belgium had recently been secured by the company. It had, stated Mr. Guy, been proved that for a service of vehicles at intervals not greater than 20 minutes in a populous area the trolley 'bus was not only the most economical form of transport, but, because of its greater acceleration, a higher average speed could also be maintained than with an ordinary petrol 'bus.

Telegraph and Telephone Notes.

China.—TELEPHONE CAPITAL.—Following the report on the Shanghai Mutual Telephone Co. by a home expert, Mr. B. O. Anson, the raising of Tls. 8,000,000 was put before three of the leading telephone equipment manufacturers, whose tenders were to be in the hands of the company by January 6th. *Eastern Engineering* points out that, if the suggestion is carried out, there will have to be financial reorganisation, as under the Hong-Kong ordinances the company cannot increase its capital by an amount larger than its present capital, which is Tls.2,500,000. The installation of a Kiangsu-Chekiang service, connecting Shanghai with Hangchow, has begun. The Shanghai-Fengching section should be in operation by the end of the year. A direct military line connecting Nanking, Chinkiang, Changchow, Wusih, Soochow, Kunshan, Shanghai, and Hangchow will shortly be installed.

NEW WIRELESS STATION.—A contract has been signed between the Central Government and the Telefunken Company, of Berlin, for the erection in Nanking of a powerful wireless station. In this connection a number of Chinese engineers who have made a speciality of wireless transmission will shortly proceed to Germany for the purpose of studying the organisation of the German services and inspecting the leading German electrical concerns.—*Reuter's* (Nanking).

Germany.—PHONOGRAMS.—The German Post Office is installing public telephone boxes from which not only can trunk calls be made, but telegrams may also be dictated to the operator at the exchange, reports *Reuter's* Cologne correspondent. The apparatus, which has already become popular in several of the larger towns, provides for the acceptance of 5-pfennig, 10-pfennig, 50-pfennig, and 1-mark coins.

RADIO-TELEPHONY.—A new wireless telephone service between Berlin (Germany) and Rio de Janeiro (Brazil) was inaugurated on March 21st.—*Reuter's* (Berlin).

Northern Ireland.—TELEPHONE PROGRESS.—During the past year there was a net increase of 1,433 in the number of telephone stations in Northern Ireland; there were 1,580 cessations. The number of calls during the year exceeded 23½ millions. Automatic telephone working in rural areas had been introduced.

Panama.—RADIO-TELEGRAPHY.—The American State Department and the Panama Government have exchanged official communications in connection with the latest concessions that Panama has granted to the British Alves Company in the vicinity of the canal, giving the company the right to erect and use wireless stations. The *Financial Times* states that Panama has assured the United States that Panama does not intend to violate the decree of August 29th, 1914, granting the United States control of wireless within the Republic, and that the British concessionaires cannot use wireless without the consent of the United States. It is understood that Panama has explained that the wireless rights clause was overlooked when the concession was granted.

Radio Notes.

Denmark.—LICENCE FEES.—According to a decision by the Minister of Public Works, listeners are to pay a licence fee of 10 kroner (about 11s.) for the financial year, April 1st, 1930, to March 31st, 1931. Licences purchased during the period from December 15th, 1930, to March 31st, 1931, will be reduced to 5 kroner for the remainder of the financial year.

High-power Stations.—CONTINENTAL INCREASES.—The power of the Budapest (Lakihegy) station is shortly to be raised from 12 to 120 kW, while Bucharest is so completely outclassed in power by the Moscow station, which has for some time past had 100 kW energy and is being increased, that it is intended to raise the power of the former, at whatever cost, says *World-Radio*, to that of Moscow as soon as possible.

Imperial Broadcasting.—TENTATIVE SCHEME.—A scheme proposed by the British Broadcasting Corporation for the development of some form of Imperial or inter-Imperial broadcasting of programmes has been considered at an inter-departmental meeting of the Colonial Office with a view to its discussion at the coming Colonial Conference. The scheme is still in a very tentative shape, and *The Times* understands that two of the points that will have to be decided before any decision to start broadcasting can be reached will be the provision of additional finance and the arrangement of schedules of times suitable for the Colonies which it would be intended to serve. It is too early to state whether the subject will come before the Imperial Conference in the autumn.

The B.B.C.—INCOME.—The Government revenue departments' estimates for the year ending March 31st, 1931, reveal the Post Office's anticipation that its grant to the British Broadcasting Corporation will be £1,060,000, as compared with £963,000 in 1929-30, which means that the Post Office expects to receive a larger income from its administration of the service than it did last year.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—Buenos Aires.—May 22nd. Department of Sanitary Works. Three electric pumping sets, piping and valves. (A.X. 9219.)*

Australia.—Melbourne.—May 5th. State Electricity Commission of Victoria. Supply of 22,000-V current limiting reactors. (B.X. 6226.)*

May 12th. Supply of 22,000-V pin-type supporting insulators for 12 months. (B.X. 6179.)*

May 20th. Posts and Telegraph Department. Terminal strips. (B.X. 6247.)* Telegraph instruments. (B.X. 6248.)*

Aylesbury.—Electricity Department. Supply of electrical materials for 12 months, commencing April 1st, 1930. (March 21st.)

Belgium.—April 5th. Municipal Authorities of Saint Gilles, Brussels. 1,000 Ah meters (5A), 400 for 3A and 204 of various capacities, all for 220 V d.c. circuits. Particulars for 5 francs from Service de l'Electricitè, 40, Rue de Bethléem, St. Gilles. Tenders to Hotel de Ville.

April 11th. Municipal Authorities of Antwerp. Supply and erection of two mercury rectifiers at the transformer station at Quai 232, Antwerp. Particulars for 6 francs from Hotel de ville.

Bexhill.—April 22nd. Electricity Department. Laying and jointing of approximately 1,600 yd. of 0.05 sq. in. three-phase 11,000-V cable. (March 14th.)

Bingley.—April 1st. Education Committee. Installation of electric lighting at the Bingley and Crossflatts Council School, and school house.—B. Leah, Education Office, Bingley.

Congleton.—Corporation. April 1st. H.p. and l.p. switchgear, transformers, kiosks, h.p. and l.p. cables, and l.p. overhead distribution. (March 7th.)

Denmark.—Copenhagen.—May 10th. Lighting Department. Switchgear and rectifier plant for the new automatic substation at Eskildsgade, Copenhagen. (B.X. 6271.)*

Dundee.—April 10th. Electricity Department. Supply of e.h.p. and l.p. paper insulated l.c. and double steel tape armoured cable. (March 21st.)

April 23rd. Transport Department. Twelve months' supply of materials, including armature and field coils, &c. Specifications from general manager.

France.—Syndicat Intercommunal d'Electricité des Deux-Sevres of Tours is inviting tenders for the erection of a series of 3,200-V transmission lines in connection with its scheme of providing a supply of power to 195 villages in the Department of Deux-Sevres.

India.—Indian Stores Department. April 8th. Oil engine driven d.c. generating sets for the Manzai power station of the Military Engineering Service. (B.X. 6270.)*

London.—Central Electricity Board.—March 31st. Supply, delivery and erection of metering equipment required in the area of the North-West England and North Wales Electricity Scheme. (February 28th.)

April 7th. Supply, delivery and erection of 66-kV and lower voltage transformers. (March 7th.)

April 16th. Construction of site works and foundation works for the transformer stations at Ribble (Preston) and Lancaster. (See this issue.)

London County Council.—April 14th. Supply and delivery of h.p. and l.p. cables and reconstruction of existing l.p. cables. (March 21st.)

St. Pancras.—April 3rd. Borough Council. Supply of e.h.p. switchgear. Supply of l.p. switchboards. (March 21st.)

Bethnal Green.—March 31st. Borough Council. Supply, delivery and erection of one 1,000-kVA and two 500-kVA three-phase transformers. (March 21st.)

New Zealand.—Wellington.—May 6th. Public Works Department. 750-kVA transformers for Arapuni power scheme. (B.X. 6095.)*

May 13th. 110-kV transformers for Mangahao power scheme. (B.X. 6096.)*

May 27th. Supply of 110-kV suspension insulators for the Waitaki power scheme. (B.X. 6216.)*

June 24th. Outdoor steelwork and 110-kV switchgear for the Waitaki power scheme. (B.X. 6238.)*

May 13th. Posts and Telegraph Department. Terminal strips. (B.X. 6209.)*

Palermo.—The Department of Overseas Trade states that an inquiry has been received from Palermo for five 80-ton electrical coal conveyors, and 20 2- to 5-ton capacity electric cranes. (A.X. 9302.)

Stoke-on-Trent.—April 9th. Electrical Engineer's Department. Supply and erection of e.h.p. and l.p. overhead transmission lines. (March 21st.)

Swindon.—April 4th. Great Western Railway. Supply of electric wires and cables and telegraph ironwork. (March 21st.)

Watford.—April 1st. Town Council. Wiring houses for lighting and heating. A. W. Barham, borough electrical engineer, Cardiff Road.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Ashford (Kent).—Urban Council. Accepted:—
1,050-kW generator for the electricity works (£9,500).—Richardsons, Westgarth & Co., Ltd.

Ayr.—County Council District Committee. Accepted:—
Electrical work at 20 houses at Auchinleck (£120).—D. Macrae (Cumnock).

Bexhill.—Electricity Committee. Recommended:—
Meters (£1,030).—Chamberlain & Hookham, Ltd.
Switchgear (£457).—A. Reyrolle & Co., Ltd.
Rectifier equipment (£1,492).—Hewittic Electric Co., Ltd.
Feeder switchgear (£220).—Bertram Thomas.

Bournemouth.—Finance Committee. Accepted:—
Lighting and heating police boxes (£342), with maintenance charge of 9s. 6d. per box per quarter.—Bournemouth and Poole Electricity Supply Co., Ltd.

Brighton.—Water Committee. Recommended:—
Electrically-driven booster plant at Telscombe waterworks (£745).—Pulsometer Engineering Co., Ltd.

Aquarium Committee. Accepted:—
Band repeater equipment (£325).—Standard Telephones and Cables, Ltd.

Tramways Committee. Accepted:—
Cable (£1,590).—W. T. Glover & Co., Ltd.
Tires (£152).—Andrew Brown & Co.
Trolley wire (£201).—Whitecross Co., Ltd.
Lamps (£102).—Tungstalite, Ltd.

Lighting Committee. Recommended:—
Lamps for illuminations (£340).—Edison Swan Electric Co., Ltd.
Steam pipe extensions, Southwick (£1,350).—Aiton & Co., Ltd.

Croydon.—Tramways Committee. Recommended:—
50 tons tram rails (£570).—Cargo Fleet Iron Co., Ltd.

Electricity Committee. Recommended:—
Switchgear (£1,381).—A. Reyrolle & Co., Ltd.

Glasgow.—Health Committee. Recommended:—
Additional electrical installations at Shieldhall Hospital (£265).—Darroch & Espie.

Transport Committee. Reconditioning of 300 tramcars, the total cost being approximately £208,147. Recommended:—
Motors, &c.—General Electric Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd.
Controllers.—English Electric Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd.

Roller bearing axle-boxes.—Ransome & Marles Bearing Co., Ltd., Hoffman Manufacturing Co., Ltd., and Skefko Ball Bearing Co., Ltd.
Air brake equipment.—Consolidated Brake & Engineering Co., Ltd., and Electro-Mechanical Brake Co., Ltd.
Magnetic track brakes.—Metropolitan-Vickers Electrical Co., Ltd., and Electro-Mechanical Brake Co., Ltd.
Truck forgings, side frames and end sills.—Brush Electrical Engineering Co., Ltd.
Suspension bars.—P. & W. MacLellan, Ltd.

Government Contracts.—The following contracts were placed by the various Government Departments during February, 1930:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.

Alternators.—Haslam & Newton.
Electric cable.—Anchor Cable Co., Ltd.; British Insulated Cables, Ltd.; Craigpark Electric Cable Co., Ltd.; Edison Swan Cables, Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; W. T. Glover & Co., Ltd.; Greengate & Irwell Rubber Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Hooper's Telegraph & India-Rubber Works, Ltd.; India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Liverpool Electric Cable Co., Ltd.; Macintosh Cable Co., Ltd.; St. Helens Cable & Rubber Co., Ltd.; Siemens Bros & Co., Ltd.
Cells.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Fuller Accumulator Co. (1926), Ltd.; D.P. Battery Co., Ltd.; London Battery & Cable Co., Ltd.
Electric travelling jib crane.—Cowans, Sheldon & Co., Ltd.
Electric tower crane.—Sir Wm. Arrol & Co., Ltd.
Electric lamps.—General Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; Edison Swan Electric Co., Ltd.; Metro-Vick Supplies; Siemens Electric Lamps and Supplies, Ltd.
Lampholders.—General Electric Co., Ltd.; Kerson's Manufacturing Co., Ltd.; W. McGeoch & Co., Ltd.; Rainsford & Lynes, Ltd.; Revo Electric Co., Ltd.; Sperryn and Co., Ltd.
Electric lifts.—Herbert Morris, Ltd.
Electric radiators.—Edison Swan Electric Co., Ltd.
Automatic starters and resistances.—Watford Electric and Manufacturing Co., Ltd.
E.h.p. switchgear, &c.—Crompton Parkinson, Ltd.
W/t tuner amplifiers.—Marconi's Wireless Telegraph Co., Ltd.
W/t tuner.—Radio Instruments, Ltd.
W/t valves.—General Electric Co., Ltd.
Copper wire.—Concordia Electric Wire Co., Ltd.; Connolly's (Blackley), Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; London Electric Wire Co. & Smiths, Ltd.; Potter & Soar, Ltd.; Saxonia Electric Wire Co., Ltd.; Ward & Goldstone, Ltd.

WAR OFFICE.

Dynamos.—J. H. Holmes & Co., Ltd.

AIR MINISTRY.

Accumulators.—Chloride Electrical Storage Co., Ltd.
Electric cable.—British Insulated Cables, Ltd.
Modification of electrically heated clothing.—Dowsing Radiant Heat Co., Ltd.
Generators.—British Thomson-Houston Co., Ltd.
Receivers.—H. W. Sullivan, Ltd.

POST OFFICE.

Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; Ericsson Telephones, Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.; Sterling Telephone & Electric Co., Ltd.; Telephone Manufacturing Co., Ltd.
Miscellaneous apparatus.—Chamberlain & Hookham, Ltd.; Power Equipment Co., Ltd.; Telephone Manufacturing Co. (1929), Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.; Standard Telephones & Cables, Ltd.; Walters Electrical Manufacturing Co., Ltd.
Cable bearers.—Bayliss, Jones & Bayliss.
Cable.—British Insulated Cables; Callender's Cable and Construction Co., Ltd.; Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. and Co., Ltd.; Standard Telephones & Cables, Ltd.; Union Cable Co., Ltd.
Loading coils.—General Electric Co., Ltd.; Siemens Bros. and Co., Ltd.; Standard Telephones & Cables, Ltd.
Cords for telephones.—British Insulated Cables, Ltd.
Ducts.—Albion Clay Co., Ltd.; Hepworth Iron Co., Ltd.; Jas. Oakes & Co. (Riddings Collieries), Ltd.; Oates and Green; J. Place & Sons, Ltd.; Standard Brick & Terra Cotta Co., Ltd.
Dynamotors.—W. Jones & Co.
Ebonite.—India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.
Insulators.—J. Bourne & Son, Ltd.; Bullers, Ltd.; Doulton and Co., Ltd.; T. De La Rue & Co., Ltd.; Electric and Ordnance Accessories Co., Ltd.; Litholite Insulators, Ltd.
Earthplates.—Lead Pipes, Ltd.
Tungar rectifiers.—Edison Swan Electric Co., Ltd.
Leclanché zinc rods.—Eyre Smelting Co., Ltd.; Siemens Bros. & Co., Ltd.
Manufacture, supply, drawing-in, and jointing cable.—Birmingham-Wolverhampton, Oxford-Banbury: Johnson & Phillips, Ltd.; Exeter-Honiton: W. T. Henley's Telegraph Works Co., Ltd. Portsmouth-Petersfield, Polegate-Heathfield: Callender's Cable & Construction Co., Ltd. Hanley-Uttoxeter, Chester-Whitchurch: W. T. Glover & Co., Ltd. Manchester-Chester: British Insulated Cables, Ltd. Southampton-Basingstoke: Pirelli-General Cable Works, Ltd.
Cabling and loading.—Dundee-Aberdeen: Pirelli-General Cable Works, Ltd.
Construction of jointing chambers and loading.—London-Liverpool (Birmingham-Liverpool) Section: Standard Telephones & Cables, Ltd.
Electric lifts.—Lewes station sorting office, Sunderland Telephone Exchange: W. Wadsworth & Sons.
Electric lighting.—Leicester station sorting office: W. L. Timson.
Telephone exchange equipment.—Watford (Herts.), Kings Langley, Radlett: General Electric Co., Ltd. Sub-contractors for Watford and Radlett: Crompton Parkinson, Ltd., for ringing machines; D.P. Battery Co., Ltd., for batteries. Folkestone, Hythe, Sandgate, Cheriton, Lyminge: Ericsson Telephones, Ltd. Sub-contractors for Folkestone and Hythe: Electric Construction Co., Ltd., for motor generators and ringing machines; Pritchett & Gold & E.P.S. Co., Ltd., for batteries. Chester: Standard Telephones & Cables, Ltd.
Telephone repeater equipment.—Marks Tey (Essex) and Aldeburgh (Suffolk): Standard Telephones & Cables, Ltd.

CROWN AGENTS FOR THE COLONIES.

Battery materials.—Le Carbone.
Cable.—Callender's Cable & Construction Co., Ltd.; Hooper's Telegraph & India-Rubber Works, Ltd.; Standard Telephones & Cables, Ltd.
Cable boxes.—Siemens Bros. & Co., Ltd.
Electricity meters.—Ferranti, Ltd.
Electric welding accessories.—Premier Electric Welding Co., Ltd.
Insulators.—Bullers, Ltd.
Quasi-arc electrodes.—Quasi-Arc Co., Ltd.
Train lighting.—J. Stone & Co., Ltd.
Transformers.—Metropolitan-Vickers Electrical Co., Ltd.

H.M. OFFICE OF WORKS.

Wiring.—Patent and Record Offices: Malcolm & Allan (London), Ltd.

Kettering.—Urban District Council Electricity Department.
Transformers.—British Electric Transformer Co., Ltd.; Crompton Parkinson, Ltd.

London. — BATTERSEA. — Electricity Committee. Recommended:—Contracts for 12 months:—
Cables.—Callender's Cable & Construction Co., Ltd.
Bitumen.—Dussek Bitumen Co., Ltd.
Meters.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.

HAMMERSMITH.—Electricity Committee. Recommended:—
Two 2,000-kVA Scott-connected transformers for sub-station (£1,772).—British Electric Transformer Co., Ltd.
Switchgear (£2,891).—General Electric Co., Ltd.
Three new superheaters (£1,515).—Superheater Co., Ltd.
500 yd. lead-covered and 100 yd. lead-covered and armoured 3-core 0.2-sq. in. cable (£598).—Macintosh Cable Co., Ltd.

Annual contracts:—
Stoneware conduit.—Doulton & Co., Ltd.
Insulating compound.—Dussek Bitumen Co., Ltd.
Electrical goods.—General Electric Co., Ltd.
Cables.—Connollys (Blackley), Ltd.
House service and joint boxes.—W. Lucy & Co., Ltd.
Draw-box frames and covers, and lamp columns.—Dover Engineering Co., Ltd.
Meters.—Chamberlain & Hookham, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.
Meter boards.—W. T. Henley's Telegraph Works Co., Ltd.

ADMIRALTY.
Special battery signalling lamps (several thousand).—Siemens Electric Lamps & Supplies, Ltd.

ISLINGTON.—Borough Council.
Supply of electrical accessories for 12 months.—Metro-Vick Supplies.
Electricity Committee. Recommended:—
Street lamp columns.—W. Lucy & Co., Ltd.
Street lanterns.—Revo Electric Co., Ltd.

BETHNAL GREEN.—Borough Council.
Wiring and fittings for Waterloo dwellings, Bethnal Green (£5,516).—Alpha Manufacturing & Electric Co., Ltd Accepted.

STEPNEY.—Electricity Committee.
50 disconnecting boxes for triple concentric cables and 50 for single cables (£149).—Universal Electrical Manufacturing Co., Ltd.
12 months' supply of electric conduits and fittings (£314). P. L. Dwyer & Co.

Lowestoft.—Electricity Committee.
Erection of two transformer kiosks at Kessingland:—

A. Reyrolle & Co., Ltd.	£1,538
British Thomson-Houston Co., Ltd.	850
English Electric Co., Ltd....	819
General Electric Co., Ltd.	814
British Thomson-Houston Co., Ltd.	777
Johnson & Phillips, Ltd.	775
Yorkshire Switchgear Co., Ltd.	751
Switchgear & Cowans, Ltd.	708
Yorkshire Transformer Co., Ltd.	679
Crompton Parkinson, Ltd.	654
W. Lucy & Co., Ltd.	603
Metropolitan-Vickers Electrical Co., Ltd. ...	552
Ferguson, Pailin, Ltd.	552
Foster Engineering Co., Ltd. (Recommended)	544

Switchgear, &c., for Oulton Broad:—

Switchgear & Cowans, Ltd.	£2,034
Metropolitan-Vickers Electrical Co., Ltd. ...	1,838
A. Reyrolle & Co., Ltd.	1,804
General Electric Co., Ltd.	1,797
Crompton Parkinson, Ltd.	1,578
English Electric Co., Ltd....	1,509
J. G. Statter, Ltd.	1,420
British Thomson-Houston Co., Ltd.	1,366
Ferguson, Pailin, Ltd. (Recommended) ...	1,308

Romford.—Rural Council. Accepted:—
Installing electric light in houses on the Cranham and Havering sites.—County of London Electric Supply Co., Ltd.

Southend-on-Sea.—Town Council. Accepted:—
Alterations to consumers' apparatus in connection with the change from d.c. to a.c. (£237).—City Electrical Co.
Electric siren.—Gent & Co.
Switchgear, transformers, and kiosks, in connection with the change-over.—General Electric Co., Ltd.

Tynemouth.—Electricity Committee. Accepted:—
Meter-testing equipment (£134).—Ferranti, Ltd.

Forthcoming Events.

Ideal Home Exhibition.—March 24th—April 17th. Olympia, W.

Royal Institution of Great Britain.—Friday, March 28th. 21, Albemarle Street, W. 9 p.m. "The Transmutation of Matter." Sir Ernest Rutherford, Pres. R.S.
Saturday, March 29th. 3 p.m. "Atomic Nuclei and their Structure."—Sir Ernest Rutherford, Pres. R.S.

Physical Society.—Friday, March 28th. Imperial College of Science, South Kensington, S.W. 5 p.m. Annual general meeting.

Birmingham Electric Club.—Friday, March 28th. Grand Hotel, Birmingham. 7 p.m. "The Principles Underlying Television." Mr. J. B. Kramer.

Association of Mining Electrical Engineers (Western Sub-Branch).—Saturday, May 29th. Swansea. Informal discussion on H.M. Electrical Inspector's Report.

Institution of Electrical Engineers.—Informal meeting. Monday, March 31st. Institution, Savoy Place, W.C. 7 p.m. Discussion on "Loud-speakers." Opened by Capt. P. P. Eckersley.

(Wireless Section).—Wednesday, April 2nd. Institution, Savoy Place, W.C. 6 p.m. "Recent Developments in Direction-Finding Apparatus." Mr. R. H. Barfield.

(Meter and Instrument Section).—Friday, April 4th. Institution, Savoy Place, W.C. 7 p.m. "Studies in Low-Power-Factor Measurements at High Voltages." Messrs. E. H. Rayner, W. G. Standring, R. Davis, and G. W. Bowdler.

(North-Western Centre).—Friday, March 28th. Engineers' Club, Manchester. 7 p.m. "Marine Diesel Installations." Mr. J. Calderwood. Tuesday, April 1st. 7 p.m. "I.C.I. Ltd.'s Steam and Electric Power Plant at Billingham." Messrs. H. A. Humphrey, D. M. Buist, and J. W. Bansall.

(Tees-side Sub-Centre).—Wednesday, April 2nd. Cleveland Technical Institute, Middlesbrough. 7 p.m. Annual general meeting. "The Breaking Performance of High-Power Switchgear and of a new form of Quenched-Arc Switch." Mr. L. C. Grant.

(Western Centre).—Monday, March 31st. Exeter Lecture. "Economics of Rural Electricity Supply for Domestic Purposes." Miss M. M. Partridge.

(South-Midland Centre).—Monday, March 31st. University, Birmingham. 7 p.m. "The Medical Applications of Electricity." Dr. B. Leggett.

(North-Midland Students' Section).—Tuesday, April 1st. Hotel Metropole, Leeds. 7.15 p.m. Address by the chairman of the North-Midland Centre.

Notes.

Batti-Wallah's Society.

At the annual general meeting of the Society on March 18th the following officers were elected for the ensuing twelve months:—President, Mr. W. McClelland, C.B., O.B.E.; hon. secretary and treasurer, Mr. M. Whitgift; committee, Messrs. A. E. Apps, G. M. B. Hilton, H. S. Jacob, W. Lang, H. S. May, and A. E. Mohring. The office of vice-president was abolished.

The annual dinner and dance of the Society was held at the Hotel Cecil, London, on March 21st, with its usual great success. That was the last function of the Society to be held at that hotel. In future the luncheons, &c., will take place at the Hotel Metropole, Northumberland Avenue, London, W.C.2.

There were few speeches at the dinner, the Batti-Wallahs devoting themselves to making it a jovial ladies' party. Mr. F. W. Purse made a short speech, proposing the toast of the Society and its president, Mr. H. L. Howard, and expressed the hope that its radiant light might never grow dim. The president jovially acknowledged the toast.

The president also made a surprise presentation of a gold watch to Mrs. M. Whitgift, assuring her they were deeply indebted to her for the hours she had spent in their service.

Electrical Development in North Wales.

The area of the North Wales and South Cheshire Joint Electricity Authority is supplied with electricity in bulk by the North Wales Power Company, Ltd., whose high-pressure transmission system now covers nearly the whole of the area and supplies in bulk to all the large towns.

The North Wales Distribution Company has from its commencement adopted a forward policy of encouraging the domestic load in its rural areas, and, by means of two-part tariffs with a unit charge of 1½d. per unit, has met with gratifying results in the domestic field.

Both the Power Company and Distribution Company have recently joined the group of Power and Distribution Companies controlled by British Power and Light Corporation (1929), Ltd.

The Power Company has discussed with the authorised undertakers in its area means for adjusting its present bulk supply terms in order to enable the development of the domestic load to be accelerated, and has now put forward new tariff proposals for the supply of electricity in bulk to authorised undertakers.

The Power Company's charges for supplies in bulk are, with one or two exceptions, on the maximum-demand basis, and the new proposals, whilst retaining a maximum-demand charge, include a drastic reduction of the kWh charge by as much as 0.35d. per unit for all electricity purchased in excess of the number of kWh taken during the twelve months ending March 31st of this year. This reduction is offered upon the condition that the undertakers on their part agree to offer electricity for cooking and heating at a price not exceeding 1d. per kWh, and on the understanding that the undertakers will offer consumers every facility such as the hire and hire-purchase of cookers on reasonable terms.

The new tariff proposals include the provision of current for showroom purposes free of cost to the undertakers. The free provision of current is even extended to the offices of chief executives, so that there will be no excuse for the undertaking not to "practise what it preaches." The proposals have been favourably received by authorised undertakers, to whom a direct inducement is now offered to develop to the fullest extent the domestic load. The J.E.A. called a conference of all authorised undertakers in the authority's area at the Town Hall, Llandudno, on the 21st of this month for the purpose of exploring the best methods of extending the use of electricity, with particular reference to its use for domestic purposes. The conference was attended by leading members of the electricity undertakings and others interested in the electrical development of the area. In conjunction with the conference, an electrical exhibition was held at which leading manufacturers displayed and demonstrated all kinds of electrical appliances.

Gas and Electricity.

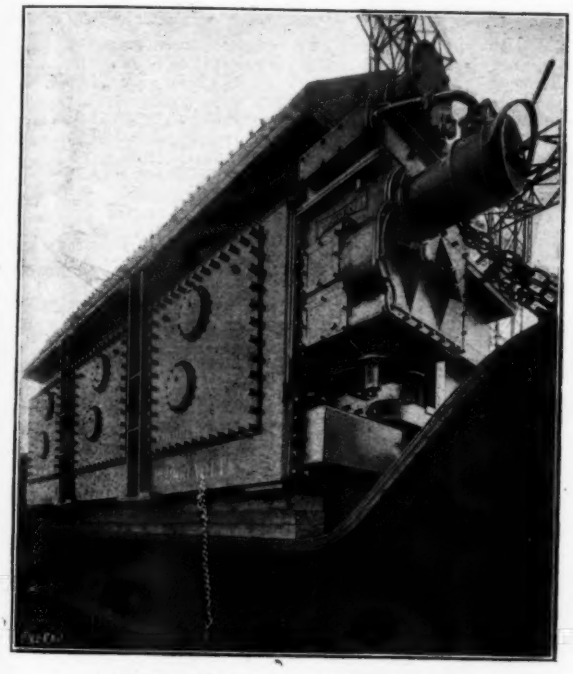
Sir David Milne-Watson, governor and managing director of the Gas Light and Coke Company, speaking as a guest of the American Chamber of Commerce in London recently, said that they could not expect to see gas and electricity walking hand in hand. That would be an ideal state of things, because there was no doubt that there was a field for gas and a field for electricity quite distinct from one another. But the opportunity was lost in this country many years ago. It was doubtful whether for many years it would be possible to bring the two industries together. In America they were wiser.

Educational.

In co-operation with the Polytechnic and Association of Principals of Technical Institutions, a scholarship foundation of far-reaching importance has been inaugurated by the Institute of Patentees (Inc.). The scholarships are open to candidates of both sexes of all nationalities and, in general, of any age over 16. They entail about three evenings' work a week in addition to home work. All applications will be considered by a committee set up by the Institute of Patentees (Inc.). Further particulars from the Secretary, 39, Victoria Street, S.W.1.

A 60,000-kVA Three-phase Transformer.

The transformer illustrated below is one of the 132,000-V sets constructed by Messrs. Ferranti, Ltd., for the Central Electricity Board, and is the largest of these yet built as a three-phase unit. It is shown at Willesden grid point on the special railway truck on which it had travelled from the Hollinwood works. This transformer is of 60,000 kVA capacity with forced-oil and air-blast cooling, but will operate at 30,000 kVA with natural cooling. The 132-kV winding is in star and the lower voltage winding (22 kV) in delta. The transformer is provided with tap-changing voltage-control equipment for varying its effective transformation ratio through a total range of 10 per cent. above normal to 10 per cent. below normal. Parallel circuits are provided on the 132,000-volt winding, each of them normally carrying half the line current. To change the voltage the circuit through one of the windings is opened by means of a quick-break oil switch, and the tappings on this winding are changed; the series switch is then reclosed, after which the same operations are carried out on the second winding. The equipment is arranged for remote electrical operation and for local operation by hand. The mechanical drive located, as will be seen



A 60,000-kVA Ferranti Transformer.

from the figure, at one end of the main tank, is contained in a weather-proof casing and runs in an oil-bath. The firm has executed or in hand orders for transformers so fitted having a total capacity of 2,250,000 kVA. The design of end-turn reinforcement is based on an exhaustive series of tests of surge conditions on transformers carried out by means of a surge generator. The H.V. bushings are of the condenser type which, apart from the porcelains, were manufactured at Hollinwood. It was specified that the transformer should be suitable for transport in oil to site under normal week-day traffic working conditions.

Locked-rotor Power Factors of Motors.

The power factors of standing motors of from 7½ to 75 h.p. are given by the *Electrical World* as follows:—

Squirrel cage, normal torque, normal current, 30 to 45 per cent.

Squirrel cage, normal torque, low current, "line start," 35 to 55 per cent.

Squirrel cage, high torque, high reactance, "line start," 45 to 65 per cent.

Squirrel cage, high torque, high resistance, high slip (elevator or machine tool motors), 50 to 80 per cent.

Automatic start, having internal resistance and short-circuiting mechanism acting at fixed speed, 60 to 80 per cent.

Slip ring, starting full load, with reasonable care in operating controller, 65 to 85 per cent.

A Large Plater's Motor-generator.

The note under the above on p. 550 of our March 21st issue apparently does not contradict the remark in our February 28th issue. Messrs. Eck & Brook, Ltd., assure us that their machine was designed to furnish a continuous output 20 per cent. greater than that indicated on its load plate and that it is therefore capable of giving 86 kW, as against the 80 kW mentioned by Messrs. J. H. Holmes & Co., Ltd. That is, the former machine, which weighs 14 tons net, was designed for outputs of 12,000 amperes at 6 volts, or 6,000 amperes at 12 volts, plus 20 per cent. permanently, as desired.

Behaviour of Electrons in a Gas Tube.

The late Mr. A. A. Campbell Swinton observed (*Proc. Roy. Soc.*, 61, 79; 1897) that a carbon anticathode in a gas X-ray tube under certain conditions showed a ring of fluorescence, which he considered to be due to the hollow nature of the cathode stream. An account of some experiments with a gas X-ray tube of the Shearer type, given in the supplement to *Nature* of March 22nd, shows that the effect can be more complex than is usually suspected.

The anticathode end of a Shearer tube was replaced by a brass tube of approximately the same length and diameter. The tube was waxed in the usual way to the glass cylinder of the X-ray tube and was sealed at the other end by a glass plate so that the luminescence due to the electron stream from the cathode could be viewed end on.

It has been found that the glass fluoresces in a very striking manner. At a pressure just greater than that at which the tube would normally be worked when producing X-rays, two bright concentric rings appeared, the outer one rather diffuse, the inner remarkably sharp. As the pressure was decreased the inner ring subdivided into others equally well defined, and later, a bright point of fluorescence appeared at the centre of the rings accompanied by intense local heating of the glass and the production of X-rays. The voltage applied to the tube was of the order of 10,000 V, and the effect observed was the same whether the current was alternating or rectified; an increase in voltage seemed merely to intensify the rings and to result in their further subdivision. That the rings are caused by electrons is shown by the fact that they can be moved by a magnet; that they do not occur at different moments of a single discharge cycle can be shown by viewing them in a rotating mirror.

Deepwater Power Station.

The Deepwater power station, which is owned jointly by the American Gas and Electric Company and the American Gas Improvement Company, and is situated on the Delaware River, New Jersey, is about to be put into operation.

The ultimate capacity of the station will reach 400,000 kW, but the present installation consists of 2-53,000-kW cross-compound turbine sets for general supplies, and a 12,500-kW turbine set for supplying steam and electricity to an adjoining works.

All turbines are designed to operate on steam at a pressure of 1,200 lb. and temperature of 725 deg. F. Each of the 53,000-kW units consists of an 11,000-kW high-pressure element and a 42,000-kW low-pressure element, the latter operating at approximately 400 lb. per sq. in. pressure and exhausting into a 42,500-sq. ft. condenser. The 12,500-kW turbine is identical in design with the 11,000-kW high-pressure elements of the cross-compound units. The exhaust from this unit, amounting to 530,000 lb. per hour at full load, is supplied to the company after being superheated to a total temperature of 440 degrees.

Steam is supplied from six boilers operating at 1,350 lb. per sq. in. pressure. Equipped with economisers, the boilers are so arranged that two of them supply each turbine. For the cross-compound units there is one standard and one reheat boiler, while for the smaller unit the boilers are both standard.

An interesting feature of the plant is the installation of two different systems of pulverised-coal firing, the bin system and the unit system. This arrangement was adopted because of a disagreement between the two proprietary companies as to the merits of the two systems.

Local Society.

The Manchester Electro-Harmonic Society held its concluding concert of the present season on March 21st, when Mr. J. A. Robertson, the president, occupied the chair. He reminded the company that he was retiring from the presidency of the Society, and that Mr. H. C. Lamb, chief electrical engineer, Manchester Corporation, had accepted the invitation to be the next president.

E.P.E.A. Dinner.

The tenth annual dinner of the London Western Section of the E.P.E.A. was held on March 22nd at St. Ermin's Hotel, Westminster, S.W., Mr. J. F. Savent presiding. In proposing the toast of "The Association," Alderman B. J. Samuels referred to the progress of electricity and the high efficiencies being obtained, and emphasised the need for lowering the cost of distribution as well as generation. He also remarked on the friendly state of all parties on the National Joint Board, and stated that the membership of the Association was now considered as a standard of efficiency and progress in the industry. Mr. A. E. Ricketts (vice-president of the Association), in responding, referred to the N.J.B. discussions on salary schedule proposals, and mentioned that while they were all anxious for peace in the industry, it would not be peace at any price, and employers must be prepared to give a fair share in return for high efficiency and service. Mr. W. J. Oswald proposed the toast of "Our Section and our Chairman," and referred to Mr. Sarvent's appointment to the Leeds undertaking (Kirkstall station). He mentioned the high standard of the section in all things appertaining to the Association. Mr. Sarvent suitably responded. An excellent entertainment followed, and during the evening the chairman thanked the organisers for a fine programme, Mr. W. Cornet (hon. secretary) responding.

Appointments Vacant.

Mains foreman for Loughborough Corporation Electricity Department.

Chief clerk for the Littlehampton undertaking of the Sussex Electricity Supply Co., Ltd.

Engineer and manager of the electricity undertaking for Brighton Corporation.

Showroom manager for Southport Electricity Department.

Assistant for inspection of kinemas and theatres for the West Riding County Architect's Department.

Mains engineer required for the Mid-Cheshire Electricity Supply Co., Ltd.

Commercial assistant engineer for Battersea Borough Council Electricity Department.

Constructional draughtsman for Hull Corporation Electricity Department.

Shift engineer for Stockport Electricity Department.

Showroom lady assistant for Burnley Electricity Department. (See our advertisement pages to-day.)

Telephony in India.

Correction.—With reference to the note under the above heading published on p. 74 of our January 10th, 1930, issue, the Deputy Director-General, telegraph traffic, Indian Posts and Telegraphs Department, informs us that the report made therein of a representative of a Calcutta newspaper having had a telephone conversation from Karachi to London is not correct. The demonstration given to Press representatives at Karachi was of telegraph (not telephone) service. He further points out that the information given regarding the number of straight-line connections to telephone exchanges worked by the Indian Posts and Telegraphs Department is also wrong. The number of such connections in the year 1927/28 stood at 17,564, and not 1,754 as reported.

Surface Combustion.

In a lecture delivered by Mr. M. V. Hurst before the Junior Institution of Engineers recently, he described and demonstrated the Cox system of surface combustion, the invention of Prof. Bone. The system ultilises coal gas, petrol, &c., which, mixed with a correct proportion of air at a pressure of about 3 in. of water, is fed to "combustors" formed of a granulated material compressed into various shapes on the surface of which the mixture burns without visible flame. For a few moments immediately after lighting the surface of the combustor is covered with a thin film of blue flame which gradually recedes below the surface of the combustor and raises it to incandescence. The "combustors" are contained in iron boxes and a space is left between the underside of the combustor (which is about 1½ in. thick) and the back of the box into which the gas is fed by the supply pipe. The combustors can be used in any position. It was stated that by this system a much greater volume of gas could be consumed per given area of burner than by any other system, in some cases 750 B.th.u. per sq. in. of surface per hour was consumed. There was also no trace of carbon-monoxide in the products of combustion, and no excess air was required. The system had now been perfected so as practically to preclude the possibility of backfiring. The combustors had been applied to water heating, steam raising, furnaces for temperatures up to 920 deg. C., metal melting, and many applications in food cooking.

The Power Plant of I.C.I., Ltd.

In the discussion on the paper read before the I.E.E., and reported in our issue of March 21st (p. 562-3) the reference by Mr. C. H. Merz to the re-design of the North Tees station should have read as the re-design of the Billingham station.

Rural Electrification in France.

The progress of France in electrical construction during the past 10 years has been extensive. According to *Commerce Reports*, at the end of the war there were only 7,000 communes, or 19 per cent., equipped with rural electric service. On January 1st, 1929, 22,419 of the 37,981 communes in the 90 French Departments were electrified. At present over 60 per cent. of all the communes, containing 80 per cent. of the entire population, have electricity directly available for light and power. The degree of electrification has reached 90 per cent. in 12 departments, and 75 per cent. in 28 others. The programme in course of execution should be completed within 10 years, at which time all except a few sparsely settled communes will be electrified.

Since 1920 the annual budgets have carried appropriations for rural electrification. In 1929 the amount was 200,000,000 francs; and, if the budgetary proposal is adopted, it will be 300,000,000 francs for 1930. Thus far the participation of the State has exceeded 700,000,000 francs on electrical extensions costing 2,000,000,000 francs, the rest being borne by the communes affected. The Ministry of Agriculture examines petitions for allotments presented by the local authorities of communes or groups of communes. In addition to the donation granted, loans at low interest and for a long period may be obtained from the Caisse du Credit Agricole. If further financing be necessary, the communities may issue bonds.

In most instances the contract for the distribution system is made with a company already engaged in producing or transmitting electricity. The contract fixes a scale of rates to be charged and contains provisions relative to the upkeep of the lines. In exceptional instances the commune itself erects the lines and operates them.

A large proportion of the electrified communes have formed a national organisation known as the Federation des Collectivites de l'Electrification Rurale, which has headquarters at Paris. This association maintains a technical and legal service that furnishes standard forms of contract for electrical construction, schedules of rates for current, and represents the rural electrification groups in Parliament, governmental administrations, and the electrical industry.

The latest compilation of statistics relates to 1927. Out of 21,000,000 people, or 53 per cent. of the total population of France, inhabiting the rural districts, consumers of electricity represented from 10 to 20 per cent. in the different electrified communes. Consumers of motive power represented 0.40 to 3.35 per cent. of the population served. The use of electric energy for agricultural work has been slightly developed.

Electricity is available to 60 per cent. of the farms.

Prices for current vary greatly in the different communities, ranging from 2.7d. to 7d. per kWh for lighting, and from 1.65d. to 5d. per kWh for power. The annual consumption of energy per consumer in most of the electrified areas is between 500 and 1,000 kWh. The consumption of current for power is extremely variable, ranging from about 100 to 1,000 kWh.

Resistance Welding Machines.

Modern improvements in electric resistance welding machines formed the subject of a lecture recently delivered before the Institution of Welding Engineers by Mr. C. A. Hadley, who described and illustrated typical examples of each type. The paper points out that, although resistance welding machines are used perhaps more extensively abroad than in this country, one can purchase British-made machines at least equal in operation to the foreign article. For consistently producing welds of high efficiency with machines extraordinary care must be taken in the design of the moving parts in order to avoid rapid wear, on account of the presence of heat and scale, which rapidly destroy the accuracy of moving parts if permitted to do so. If proper metallurgical and physical conditions are observed, a weld of 100 per cent. efficiency (with a suitably constructed machine) can be approximated to very closely under commercial working conditions. Accurate timing of the heating and forging periods is the essence of producing the perfect weld.

The saving effected by spot welding over rivetting varies from 20 to 75 per cent., the operation being also more rapid than rivetting; less floor space is required, as one spot-welding machine often replaces two or three rivet gangs.

An important firm in the Midlands has started the production of electric resistance-welded tubes on a large scale. The process is a mixture of seam- and butt-welding in so much that the strip, after being formed into a tube, passes between rolls which convey the heating current across the butted edges and also apply pressure to close the weld. A tube welded by this process is equal in many ways to a seamless cold-drawn tube, and has the advantage that it can be produced at a fraction of the cost.

A Large Single-phase Locomotive.

The Swiss Federal Railways have recently placed an order with the Oerlikon Company for a locomotive which will be, it is believed, the largest locomotive so far built in Europe. The locomotive is of the 1 Bo 1 Bo 1+1 Bo 1 Bo 1 type.* The total continuous-rated output of the driving motors, measured at the shaft, is 6,560 h.p., and the corresponding speed is 41.3 m.p.h. The locomotive is to be built as a double machine, the two halves being close-coupled, with a driver's cab arranged at either end behind the hood-shaped extensions. A step-down transformer, together with built-on gear for the h.p. control, will be mounted over either of the two middle carrying axles. The two outer and the two inner carrying axles are to be grouped with the adjoining driving axles, so as to form separate bogies, respectively. In order to ensure good running qualities on curves, the driving axles are each to have a side play of 2×20 mm., and the two middle carrying axles a side play of 2×30 mm. The locomotive halves are interchangeable mechanically. There are, however, certain parts of the electrical equipment which are only provided singly—for instance, the main circuit breaker, the compressor set, and the generator for the supply of the lighting and control circuits, and its regulating gear. The electrical equipment is so designed that these parts can be fitted and connected either on one or on the other half of the locomotive, as desired. The torque of the driving motors is transmitted to the axles by means of the "Universal" individual axle drive of the Winterthur Locomotive Company—the suppliers of the mechanical part—which embodies double reduction gear. The motors, which are separately cooled and number 16 in all, are arranged one over each driving axle, on one side in relation to the latter, and in the direction of the longitudinal axis of the locomotive and of the "Universal" drive. As the locomotive is intended for the St. Gotthard line, which comprises very steep gradients, it is equipped for regenerative braking by the Oerlikon method. The locomotive has four current collectors. The operating gear for the latter is arranged for the control of only three of these current collectors from the driver's cab, under normal conditions, the fourth being used as a standby.

* 1=one carrying axle, Bo=two driving axles with individual drive.

The Electrical Equipment of Motor Vehicles.

The percentage figures of the causes of failure and breakdown of motor vehicles on the road analysed from the reports drawn up in connection with the "Get You Home" scheme which the Royal Automobile Club issues each year, form interesting reading. The figures have now been issued for five years and we extract from them, in the following table, the percentages of the total failures which have been attributed to the electrical equipment:—

	Ignition Failure Per cent.	Starting Failure Per cent.	Lighting Failure Per cent.
1925 ...	22.7 ...	0.4 ...	2.3
1926 ...	22.5 ...	0.6 ...	2.1
1927 ...	21.0 ...	0.9 ...	2.2
1928 ...	22.7 ...	1.0 ...	2.0
1929 ...	20.3 ...	1.0 ...	2.4

It may be mentioned that in the full return the causes of failures are set out under twenty-one different headings and that they indicate ignition troubles as being the principal cause of failure. Although in the majority of cases the troubles and delays were largely of a trivial character, most of them being doubtless due to lack of attention to the ignition components by the car owners themselves, the fact that ignition failures still head the list should spur manufacturers of such components to endeavour to effect further improvement and simplification. Whilst the lighting and starting equipment of motor vehicles appears to be fairly reliable, judging from the small percentage of failures recorded, the fact that in both cases slight increases have resulted suggests that manufacturers must not rest content, but must continue their research in their quest for improved apparatus and fittings.

Institution of Electrical Engineers.

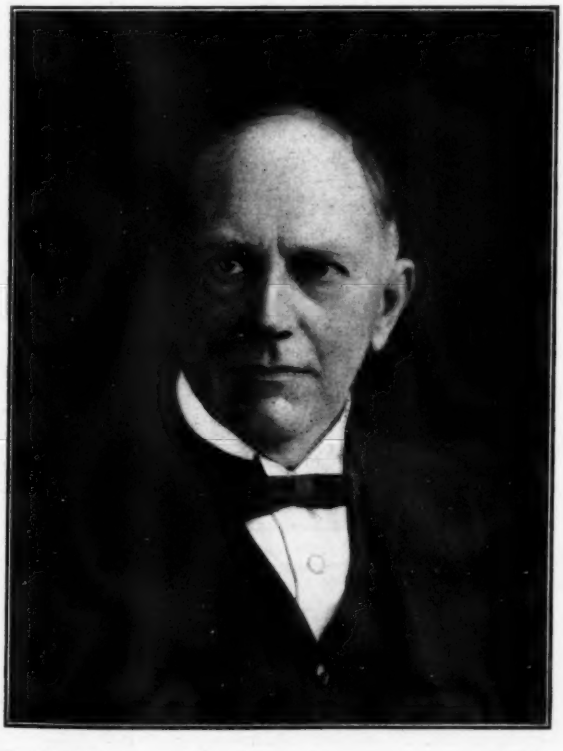
WESTERN CENTRE SUMMER MEETING.—The annual week-end summer meeting of the Western Centre of the Institution is to be held from Friday to Monday, May 23rd to 26th, 1930, at the Sedbury Park Hotel, near Chepstow, a delightful locality. Ladies are specially invited, and early application for accommodation is advisable.

INFORMAL MEETING.—At the informal meeting of the Institution on March 17th, Mr. M. Whitgift was in the chair, when Mr. A. F. Harmer opened a discussion on "H.T. Sub-station Switchgear." In the work which he had been carrying out for his company during the past few years his object had been to carry out schemes at a low cost by simplifying the gear, so that it automatically became cheap, though well-made and of proper materials. The labour of fitting up simple gear was very much less, it was easier to handle in confined spaces, such as one was bound to meet in practice, while there were no fine adjustments, or careful lining up, as with truck gear. A sub-station of a capacity, say, up to 300 kVA, at pressures of 6,600 to 12,000 volts in certain districts was necessary at every street corner. Mr. Twiss stressed this point at a recent meeting, stating that they might see a return of the old method of a.c. distribution, namely, house-to-house transformers, and Mr. Harmer was in entire agreement. What then, was the simplest arrangement that can be used? In solving this riddle the "Metesco" ring opener resulted. Mr. Harmer showed a number of slides illustrating the various types and applications of his gear, and a well-sustained discussion followed.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

We reported in our last issue that Sir HARRY HAWARD (whose portrait appears herewith) was retiring from his position as Electricity Commissioner at the end of this month. Sir Harry was appointed as one of the original Commissioners on account of his long and varied legal, commercial, and financial experience. At the time of his appointment, in 1920, he was Comptroller of the London County Council, a post which he had occupied since 1893. The Commission will not lose the benefit of his advice and experience for he is to continue to act in a consultative capacity.



Elliott & Fry [*London.*

Sir Harry Haward.
Who is retiring from the Electricity Commission.

Mr. H. WALKINGTON, late works manager of Messrs. S. G. Brown, Ltd., having retired, Mr. S. G. BROWN, F.R.S., is taking full charge of the works. He will be assisted by Mr. H. A. WEBB (Radio Department) and Mr. H. H. HEBDEN (Gyro and Electro-Megaphone Department), who have been associated with the company for many years.

At the gathering of the staff of the Dublin Electricity Department last week Mr. LAURENCE J. KETTLE, who recently retired from the position of city electrical engineer, was presented with his portrait in oils together with an album containing the signatures of the staff. The presentation was made by Mr. B. C. Muntz.

The Southend-on-Sea Town Council has appointed Mr. LINTON as mains engineer at a salary of £488 per annum.

An excellent portrait of the late Mr. H. ALABASTER, painted by Miss Elsie Gledstanes, R.B.A., is being exhibited at the forthcoming show of the Royal Society of British Artists at the Suffolk Galleries, Suffolk Street, Pall Mall, S.W., which is opening on Saturday, March 29th.

Mr. J. Wilson's successor in the office of president of the Electrical Wholesalers' Federation is Mr. A. ALBRECHT.

Mr. ARTHUR CREAK, of the Bermondsey Borough Council Electricity Department, has been appointed installations engineer by the Newport Corporation Electricity Department.

Croydon Corporation Electricity Committee reports that Mr. B. C. WARD, the distribution superintendent, has been appointed deputy engineer and manager of the Bermondsey Borough Council's electricity undertaking, and it has appointed Mr. L. GRIPPER distribution engineer to fill the vacancy at the grade scale, now £592 per annum. An article on "Electric Cable Jointing" by Mr. Gripper appears in this issue.

The January *Journal* of the British Chamber of Commerce, Shanghai, reports that Mr. A. VAN CUTSUM, the Belgian Consul at Tientsin, has been appointed manager of the Tientsin Electricity and Tramway Company.

Mr. T. MEDCALF, passenger transport manager to the Swindon Corporation, who has retired after 27 years' service, has been presented by the staff with a silver salver and an expanding bookcase.

Mr. W. MCCLELLAND, C.B., O.B.E., has been elected president of the Batti-Wallah's Society for the ensuing year.

Mr. G. H. PEAKE, deputy-chairman of the Yorkshire Electric Power Co., has been appointed chairman of the company in succession to the late Mr. A. G. Lupton.

Obituary.—SIR VINCENT CAILLARD.—The death occurred on March 18th, at the age of 73, of Sir Vincent H. P. Caillard. In the course of a long diplomatic and financial career, Sir Vincent Caillard became a director of Vickers, Ltd., in 1898, a position which he held until 1927. He was also a director of a number of subsidiaries of Vickers, Ltd., and of the Southern Railway. He was the third president of the Federation of British Industries, in the formation of which he took an active part.

Will.—The late Mr. HENRY W. BROOKMAN, formerly superintendent of the Central Telegraph Office, St. Martin's-le-Grand, left estate valued at £1,215 (£1,182 net personalty).

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrica Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

Power Contracts (Batwin), Ltd.—Private company. Registered March 15th. Capital £10,000 in £1 shares (1,000 8 per cent. cumulative preference and 9,000 ordinary). Objects: To acquire the undertaking, or part thereof, of Power Contracts, Ltd., including the trade mark "Batwin"; to adopt an agreement with that company and its liquidator, and to carry on the business of electricians, electrical and mechanical engineers, and contractors, importers and suppliers of electric motors, dynamos and equipment of every kind, &c. The first directors are: H. Constad, 20, Oakfields Road, Cranbourne Gardens, Golders Green, N.W.11, and others to be appointed by the subscribers. H. Constad is permanent chairman subject to holding 250 shares. Registered office: 138, Southwark Street, S.E.1.

Newfields, Ltd.—Private company. Registered March 19th. Capital £100 in £1 shares. Objects: To carry on the business of radio engineers, manufacturers of and dealers in gramophones, automatic machines, typewriters, electric accumulators and batteries, wireless aerials, wireless and electrical components, &c. The first directors are: H. Zahn, Ruxley Lodge, Claygate, advertising agent; L. J. Norden, 9, Leeside Crescent, Golders Green, N.W.11, sales director; J. D. Bunn, 30, Oaklands Grove, Shepherds Bush, W.12; A. F. Galloway, Hampton Court Palace, Middlesex; A. R. Reynolds, 58, Church Road, Upper Norwood, S.E.19, musical instrument maker; A. E. Hunt, 34, Chaucer Road, Herne Hill, S.E.24, radio engineer. Secretary: A. F. Galloway. Registered office: 58, Church Road, Upper Norwood, S.E.19.

International Broadcasting Co., Ltd.—Registered as a private company on March 18th. Capital £200 in £1 shares. Objects: To carry on business as wireless telegraphic, telephonic, general, mechanical, and electrical engineers, manufacturers of and dealers in machinery and all requisites pertaining to broadcasting stations; to act as advertising agents; to buy, and sell hours and time for broadcasting advertisements or sponsored programmes or any other form of broadcast publicity, &c. The subscribers are: F. Morley-Mower, 2, Park Hill, Ealing, W.5, accountant; H .J. Herring, 24, Heathfield Road, Acton, W.3, estate agent. Secretary: H. L. Tomkinson. Registered office: 11, Hallam Street, W.1.

James Dawkins & Co. (Newcastle), Ltd.—Private company. Registered March 21st. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineers, switchgear manufacturers, and armature winders, suppliers of electrical accessories of all kinds, manufacturers of and dealers in wireless accessories, &c. The directors are: J. Dawkins, 6, Russell Place, Kirkcaldy, Fife, electrical engineer (managing director); R. Wilson, 71, Glebe Park, Kirkcaldy, Fife, electrical engineer.

Bluck Electric Welding Machines, Ltd.—Private company. Registered March 18th. Capital £1,000 in £1 shares. Objects: To carry on the business of engineers, machinists, and electric welding machine manufacturers, carried on by T. H. Neville, C. R. Neville, F. J. Neville, and A. C. Neville, at 14, Lower Forster Street, Walsall. The directors are: T. H. Neville, 39, Eastbourne Street, Walsall; C. R. Neville, 47, Lichfield Road, Walhall; F. J. Neville, Grindelwald, Lichfield Road, Rushall, near Walsall; A. C. Neville, Nant-y-Glyn, Queslett Road, Great Barr, near Walsall; W. H. Bluck, 14, Lower Forster Street, Walsall. Secretary: C. R. Neville. Registered office: 21 and 22, Hatherton Street, Walsall.

Sentinel Instruments, Ltd.—Private company. Registered March 15th. Capital, £100 in £1 shares. Objects: To acquire the business of an engineer and scientific instrument maker carried on by R. L. Granville-Johnston at Newcastle-upon-Tyne, and to carry on the business of telephone, heating and ventilating engineers, makers, maintainers and repairers of and dealers in electrical and other fittings, telephones, indicators, fire alarms, lightning conductors, &c. The directors are: R. L. Granville-Johnston, Main Street, Corbridge, scientific instrument maker (present chairman); E. V. Telfer, D.Sc., Ph.D., 11, Chelsea Villas, Newcastle-upon-Tyne, naval architect. Solicitors: Hannay & Hannay, South Shields.

Official Returns of Electrical Companies.

Aeonic Radio, Ltd.—Debenture dated February 28th, 1930, to secure £4,500, charged on lands, buildings, fixtures, plant and machinery, and company's undertaking and other assets, including uncalled capital (subject to charge dated February 6th and debenture dated February 26th, 1930). Holder: J. L. Gottlieb, 10, Hillcrest Avenue, N.W.11.

Dakol Electric, Ltd.—Issues on various dates from December 29th, 1928, to July 17th, 1929, of £6,000 debentures, parts of a series already registered. (Notice filed March 13th, 1930.)

Dunoon & District Electricity Supply Co., Ltd.—Debenture dated February 28th, 1930, to secure £7,500 and further advances, together with a premium of 10 per cent. on the maximum amount at any time due. Property charged: The company's undertaking and property, present and future, including uncalled capital and the Dunoon Electricity Special Order, 1929. Holders: Johnson and Phillips, Ltd., Columbia House, Aldwych, W.C.

Allerton Electrical Supplies, Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1929. 1,500 shares taken up. £1,500 paid. Mortgages and charges: £1,400.

Prangnell Partners, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1929. 962 shares taken up. £174 10s. paid (being £1 per share on 12 ordinary and 5s. per share on 650 ordinary). £300 considered as paid on 300 ordinary shares. Mortgages and charges, nil.

Lissen, Ltd.—Capital, £700,000 in 500,000 preference shares of £1 each and 400,000 ordinary shares of 10s. each. Return dated December 18th, 1929. All shares taken up. £506 paid on 1,012 ordinary shares. £699,494 considered as paid on 500,000 preference and 398,988 ordinary shares. Mortgages and charges, nil.

William J. Hook & Co., Ltd.—Capital, £1,000 in 500 preference and 500 ordinary shares of £1 each. Return dated December 28th, 1929. 400 preference and three ordinary shares taken up. £403 paid. Mortgages and charges, nil.

Helio Dynamo Co., Ltd.—Capital, £20,000 in 8,000 "A" and 12,000 "B" shares of £1 each. Return dated January 13th, 1930. 8,000 "A" and 5,062 "B" shares taken up. £3,062 paid on 3,062 "B" shares. £10,000 considered as paid on 8,000 "A" and 2,000 "B" shares. Mortgages and charges, nil.

Read & Morris, Ltd.—Capital, £2,000 in 1,940 ordinary shares of £1 and 1,200 founders' shares of 1s. each. Return dated December 31st, 1929. 1,200 founders' shares taken up. £30 paid. £30 considered as paid. Mortgages and charges, nil.

Vee Cee Dry Cell Co. (1927), Ltd.—Capital, £4,000 in 2,000 preference and 2,000 ordinary shares of £1 each. Return dated December 26th, 1929. 1,950 preference and 2,000 ordinary shares taken up. £3,550 paid. £400 considered as paid. Mortgages and charges, nil.

Wakelin's Wireless Co., Ltd.—Capital, £2,500 in 1,250 preference and 1,250 ordinary shares of £1 each. Return dated December 1st, 1929. 135 shares taken up. £102 paid. £33 considered as paid. Mortgages and charges, £675.

City Notes.

British Insulated Cables, Ltd.

The annual meeting was held on March 21st, and Sir Alexander Roger, who presided, in the absence, owing to ill-health, of Mr. D. Sinclair (chairman), read the chairman's speech. In presenting the report and accounts (*vide* ELEC. REV., March 21st, p. 553), the chairman stated that the ordinary capital had been increased by the bonus issue of 333,333 shares a year ago, and now stood at £1,666,666. The total share capital was now £2,666,666. The £50,000 set aside last year as a "compassionate fund for workpeople," the interest on which was to provide allowances for the company's workpeople and dependents, had been invested in Government securities and had given relief to many deserving cases. During the past year £144,478 was spent on new plant and buildings. Invest-

ments stood at £1,263,753, as compared with £909,562 a year ago, the increase being primarily accounted for by the acquisition, in conjunction with another company, of practically the whole of the share capital of a cable manufacturing company of considerable size. The agreement for the sale of the Electric Supply Company of Victoria had been completed, and they would part with their holding in that company in 1932 on very satisfactory terms. The Midland Electric Corporation for Power Distribution, Ltd., continued to do well. The closer working agreement with other cable makers continued to be increasingly valuable in the interchange of research and factory methods. By its help the company had substantially improved the quality and lowered the cost of many of its manufactures. They had practically completed during the year the track electrification of the main line of the Great Indian Peninsula Railway, and this work, with the Bombay suburban electrification carried out for the same company a few years ago, constituted the most important railway equipment work yet carried out in the British Empire. The experience would enable them to undertake similar work on the largest scale for the British railways when their conversion to electric traction took place. This could not now be long delayed. They had practically completed the Scottish overhead "grid" system, and many lines were in use. New work in hand included a large extension of the e.h.p. cable work for the London Power Co., an underground trunk telephone line for the Post Office from Manchester to Chester, and an overhead connecting link between the national "grid" system and the new Clarence Dock power station for Liverpool. The factories were generally well employed, with a volume of orders in hand in excess of last year. A large number of process improvements had been introduced, and a considerable extension of plant had been made for the production of aluminium wire, while extensions for the making of condensers and enamelled wire were in progress, orders having outrun their manufacturing facilities in both commodities. Plant was being put down for the manufacture of "Rockbestos" wire, for which they had obtained world rights outside the American continent. Commenting upon the growing use of overhead wires, instead of underground cables, the chairman prophesied that because they were costly to maintain, unsightly, relatively dangerous to the public, and unreliable in operation, it was only a question of time before history, as exemplified by the Post Office adoption of underground cables, would repeat itself. The report and accounts were adopted.

Midland Electric Corporation for Power Distribution, Ltd.

The annual meeting was held on March 21st, Mr. G. H. Nisbett, a director, presiding in the absence of Mr. D. Sinclair (chairman). In reading the chairman's speech, Mr. Nisbett said that the sum of £64,770 expended during the year was largely due to extensions of mains in new districts and increasing the capacity to supply demands from domestic consumers along existing routes. Every endeavour had been made to increase the domestic load and this was reflected in increased receipts. They would have preferred to retain the areas sold, but their rights would have expired in 1940, and in the meantime the supply was being developed in the areas on a system that was not entirely suited to the purchasing authority. A number of local authorities which had the right in 1940 to purchase the company's distribution system in their respective areas was 19, and the company was endeavouring to obtain an indication of their views on the matter. Negotiations had proceeded throughout the year, but with so many councils involved, progress was necessarily slow. The report and accounts were adopted.

Automatic Telephone Manufacturing Co., Ltd.

The annual meeting was held on March 21st, Sir Alexander Roger (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, March 14th, p. 508), the chairman said that during the year four new director exchanges were completed, while good progress was made in the installation of Amherst and Primrose Hill. There were now 24 automatic exchanges in the Greater London area, and a like number was due for construction during the next few years. They were assured that a fair share of the work would accrue to the company. In the provinces completed contracts included Strowger exchanges at Dringhouses and Haxby, and extensions at Leeds, Newport, Cwmbran, and Epsom. The construction of a new director system in Manchester was well advanced. Work was proceeding on new Strowger exchanges in the Nottingham area, and they had been awarded a contract by the G.P.O. for equipping the Bristol area for Strowger operation. The chairman also referred to overseas installations. A substantial contract had been placed with the company by the Racecourse Betting Control Board for electrical totalisator equipment, and they were at present manufacturing equipment for Newmarket, Cheltenham, Leicester, &c. They had also received a contract from the Central Electricity Board for supervisory apparatus indicating such factors as voltage, current, power, and steam pressure, for the Central Scotland Electricity Scheme. The output of "Xcel" domestic appliances showed a steady increase, in face of serious competition of cheap foreign imports, and "Xcel" business overseas was increasing. They had made many valuable alliances and connections with the result that they were now a prominent link in an important chain of companies covering the U.S.A., Great Britain, Germany, and elsewhere. The number of patents owned and available through the associated companies was now over 7,000. Throughout the period during which they had been achieving reasonably good results, they had been opposed in foreign markets, and to a certain extent at home, by groups representing capital many times in excess of their own. These combinations were making efforts to secure a monopoly both of international communications and of manufacturing interests, and although the company made many attempts to interest capital in England for the purpose of developing telephone and other communications throughout the world, they were obliged ultimately to rely to a large extent on their friends in America in this and other directions. The report and accounts were adopted.

The annual meeting of the International Automatic Telephone Co., Ltd., was held on March 24th. Sir Alexander Roger again presided and made a similar review of the company's activities.

Shropshire, Worcestershire & Staffordshire Electric Power Co.

The annual meeting of this company was held on March 25th, Mr. E. Garcke (chairman) presiding. In presenting the report and accounts, the chairman said that in May last year the majority of the "A" and "B" ordinary shares were acquired by the Greater London and Counties Trust. He was authorised by the chairman of the Trust to make an interesting statement to the effect that the Trust had the intention to make a large issue of its capital to British investors as soon as the arrangements were completed and the time opportune, and that issue would include the whole of their American electrical interests in this country. The subsidiary company—the Stratford-on-Avon Electricity Co., Ltd.—had made arrangements with the Stratford-on-Avon Corporation whereby the Corporation waived its right to purchase the undertaking in 1931. They had acquired the electricity undertaking of the city of Hereford, and had also acquired the undertakings supplying in Hook Norton, Bromyard and Blockley, and those in Builth Wells, Presteign, Tolgarth, Hay and Knighton, which extended their activities into the counties of Radnor and Brecknock. Application was being made for a Special Order to supply electricity throughout these two counties and also in the rural district of Newent. The area of supply now covered about 2,400 sq. miles in seven counties. Negotiations were in progress with the Worcester Corporation for an interchange of electricity at the city of Worcester. The use of electricity for domestic purposes had made marked progress and a central service depôt had been established at Bromsgrove to ensure that the hired apparatus should be kept in the highest state of efficiency. During the year over 5,000 new services to domestic premises had been connected by the company and its subsidiaries. In Smethwick and Banbury, new showrooms had been opened, and now there were showrooms in eleven centres, while a further five showrooms would be opened in the course of the next few months. Over £816,000 had been spent on new capital works and the acquisition of undertakings during the year. The additional power connections to the mains totalled about 20,000 h.p. Since 1924, the number of consumers had increased by 270 per cent., the electrical energy sold by 91 per cent., the revenue by 73 per cent., and the average price per kWh sold had fallen by 10 per cent. to 1.25d. per kWh. The report and accounts were adopted.

Anglo-Portuguese Telephone Co., Ltd.

The report for 1929 states that the capital expenditure during the year amounted to £91,732. The gross income was £189,437 and the gross profit £71,287. After adding bank interest and providing for debenture interest, &c., there was a net profit of £50,941, as compared with £42,886 in 1928. A balance of £64,754, brought forward, is added, making £115,695. After deducting the final dividend on the ordinary shares for 1928, and the 8 per cent. dividend on the "A" ordinary shares for 1928, it is proposed to pay a final dividend of 5 per cent., less tax, on the ordinary shares, making 8 per cent., less tax, for the year (as for 1928), and a dividend of 8 per cent., less tax, on the issued 100,000 "A" ordinary shares, leaving £44,949 to be carried forward. In June last, 113,012 ordinary shares were taken up by ordinary shareholders on a *pro rata* basis at par. In addition 5,000 ordinary shares have been allotted to the company's telephone subscribers. The report records the death of the Marquez de Gouveia, the chairman of the local board, and the appointment of Mr. H. S. Bennett to the London board.

Ericsson Telephones, Ltd.

The accounts of this company were abstracted in our issue of March 14th, p. 508, and the annual meeting was held on March 19th, Mr. W. M. Crowe (chairman and managing director) presiding. In presenting the report and accounts the chairman said that the increased profit was due in no small measure to economies effected in production and to an extension to the range of manufactures. They were now manufacturing several automatic totalisators for the Racecourse Betting Control Board for erection on racecourses in this country within the next few months, and it was hoped to secure further contracts in the near future. The automatic telephone department continued to make healthy progress. Already a number of exchanges had been completed and handed over to customers, and during the present year several large

exchanges for London and abroad would be completed. Referring to telephone development in this country, the chairman said we were still too far behind. However, while the present rate of world expansion was approximately 6 per cent. per annum, the growth in this country was approximately 7½ per cent. It was obvious that our telephone system must be developed more energetically if the country was to enjoy the full benefits to be derived from such a convenient and rapid means of communication. He suggested that the Lord Privy Seal should seize the opportunity to relieve unemployment, and he paid a tribute to the work done by the Telephone Development Association. The directors had in mind a staff pension scheme in appreciation of the work done by the staff, and details of suitable schemes were now being considered. The report and accounts were adopted.

Westinghouse Electric & Manufacturing Co.

The report for the past year shows that the gross income from all sources rose from $22,329,323 to $27,316,344, and the net income available for dividends and other purposes from $20,814,940 to $27,062,611. Three quarterly dividends of $1.00 per share were paid on both preferred and common stock; in the last quarter the distribution was raised to $1.25 per share, thus placing both stocks on a regular annual dividend basis of $5.00 per share. The report mentions the arrangements whereby the company will cease to manufacture radio sets and will market those made by the R.C.A. Victor Co., Inc.; and the company's participation in the financing of the General Motors Radio Corporation, and other concerns. Minority interests were purchased in certain French and Italian companies, and the Japanese company is being liquidated, an agreement with Japanese interests having been arranged whereby Westinghouse products will be distributed under licence. The company employed an average of 50,000 people during the year, the wage bill being over $88,000,000.

Newcastle & District Electric Lighting Co., Ltd.

Presiding at the annual meeting on March 21st, Col. F. R. Simpson (chairman) said that during the year under review nearly £31,000 out of a capital expenditure of £42,435 had been spent on mains in order to meet the increasing demand for electrical energy. A noticeable development in the use of electricity during the year had been for domestic appliances for cooking and heating. To encourage the use of these, special low tariffs had been provided, and a continued increase of demand might be expected. A decrease in receipts for electrical energy, amounting to £4,201, was accounted for by the company having reduced its charges for lighting from January last year and the elimination of meter rents. An inquiry was held at Newcastle in December last into representations made by local authorities for a reduction in the charges for electricity, but up to the present no decision had been received.

Scottish Power Co., Ltd.

The trading profit for 1929 of the undertakings owned and operated by this company was £213,218, as compared with £116,639 in 1928. Of this £41,410 (against £22,522) has been reserved in the companies' accounts and the balance paid over to the Power Co. After meeting expenses, &c., there is an available balance of £150,610. Debenture interest, &c., and preference dividend are paid, £7,854 is transferred to reserve (against £4,446), and it is proposed to pay a dividend on 1,350,000 ordinary shares for the year, and 1,000,000 ordinary shares on instalments paid during the year, at the rate of 8 per cent. per annum, leaving £6,710 to be carried forward. The report states that further issues of capital will be made for the purpose of providing funds for the hydro-electric and other works under construction for the Grampian Company, which will be brought into operation about October next.

Bruce Peebles & Co., Ltd.

The financial results for 1929 were given in our last issue (p. 554). The report states that during the past year [as we reported at the time] the company entered into a working arrangement with Brown-Boveri & Co., of Baden, Switzerland, under which it has become the exclusive licensee in this country of the valuable series of Brown-Boveri patents for the manufacture of mercury-arc rectifiers. The board believes that this arrangement will prove an advantageous one for the company, but it will necessarily be some time before the full benefit of it can be secured. The report records the resignation, owing to ill-health, of Mr. A. W. Tait; to fill the vacancy thus arising, the directors have appointed Mr. A. C. Eborall, M.Inst.C.E., managing director of British Brown-Boveri, Ltd., London.

Cambridge Electric Supply Co., Ltd.

The profit for the year ended December 31st last, after providing for interest and income tax and including the amount brought forward from the previous year, is £39,914. The general reserve receives £10,000, staff benevolent fund £1,500, and £4,222 is appropriated to writing off the balance of the cost of capital expenses and premium on debentures issued. A final dividend of 5 per cent. on the ordinary shares is recommended, making 8 per cent. for the year, leaving £4,848 to be carried forward. The directors have decided to make a reduction in the price of electricity as from the date of the meter readings for the March quarter.

Waste Heat & Gas Electrical Generating Stations, Ltd.

The net profit for the year ended January 31st last was £30,566, as compared with £28,470 in the preceding year, to which is added a balance brought forward (less £300 voted to charities), making £48,180 (£43,514). It is proposed to pay a dividend at the rate of 8 per cent. for the year, leaving a balance to be carried forward of £22,580. Weardale power station has been handed over to the Newcastle-upon-Tyne Electric Supply Co., Ltd., under the terms of an agreement with the company. The output from the other power stations was satisfactory and showed an increased over the previous year. Meeting: March 31st.

Constantinople Telephone Co., Ltd.

Reuter (New York) reports that the International Telephone and Telegraph Corporation has purchased a controlling interest in the stock of the Constantinople Telephone Company. The official announcement issued on March 18th by the International Telephone and Telegraph Corporation to the above effect states that the transaction has already been approved by the Turkish Government. Turkey is the tenth foreign country to be entered by the American corporation, which already operates in Spain, Cuba, Mexico, Porto Rico, Peru, Chile, Argentina, Uruguay, and Brazil.

Oswestry Electric Lighting & Power Co., Ltd.

The report for the nine months ended September 30th last shows a net profit of £360, to which is added £1,248 brought forward, making £1,608. A dividend at the rate of 10 per cent. per annum for the nine months only is paid. The Oswestry Borough Council has agreed to pay the sum of £19,300 for the company's undertaking and to take over the management as from October 1st last. It is expected that the purchase will shortly be completed, when arrangements will be made for winding up the company.

British Aluminium Co.

The net profit for 1929 was £443,102, to which is added £33,843 brought forward, making £476,946. After meeting debenture charges, &c., placing £50,000 to depreciation reserve, £100,000 to reserve fund, and £10,000 to staff benefit fund, there is a balance available for dividends of £153,637. It is proposed to pay a final dividend of 6 per cent. on the ordinary shares, making 10 per cent. for the year (as for 1928), leaving £35,559 to be carried forward.

City of London Electric Lighting Co., Ltd.

The balance of net revenue for 1929 was £272,294, as compared with £253,341 in 1928. After meeting the standard dividends (10 per cent. in the case of the ordinary shares), placing to reserve the company's share of consumers' benefit (£58,042), and appropriating £39,278 for co-partners' benefit, a balance of £6,974 is carried forward. The energy sold totalled 88,928,115 kWh, and the maximum demand was 51,800 kW.

Companies Struck off the Register.

The names of the undermentioned companies have been struck off the register and they are thereby dissolved:—

Dartmoor Electric Supply Co., Ltd.
Magneto & Spare Part Co., Ltd.
Napier-Kimber, Ltd.
Scholey & Co., Ltd.

Shoreham & District Electric Lighting & Power Co., Ltd.

The net profit for the year ended December 31st last was £490. It is proposed to pay a dividend at the rate of 2½ per cent. per annum on the ordinary shares, leaving £156 to be carried forward. The sales of electricity increased from 156,752 to 239,375 kWh.

Vickers, Ltd.

The profit for the year ended December 31st last, after payment of debenture interest, was £941,971. After deducting the preference dividend and adding £217,704 brought forward, a total of £741,485 is available. It is proposed to place £250,000 to reserve, and to pay a dividend of 8 per cent., less tax, on the ordinary shares (as for 1928), leaving £228,754 to be carried forward.

Salisbury Electric Light & Supply Co., Ltd.

The report for the year ended December 31st last shows that the balance on the year's working, after paying interest on debentures and providing for income tax and depreciation, and including the balance brought forward, amounted to £11,094. A final dividend of 6 per cent. is paid, making 10 per cent. for the year, and £94 is carried forward.

Scottish Tube Co., Ltd.

The net profit for 1929 was £70,137. Debenture interest takes £405, provision for depreciation £15,000, and preference dividend £15,000. Of the balance, it is proposed to place £30,000 to reserve (in 1928 £15,000 was taken from reserve), and to pay a dividend of 2½ per cent. on the ordinary shares (against nil), leaving £8,173 to be carried forward.

Yorkshire (West Riding) Electric Tramways Co., Ltd.

The net income for the past year was £26,854 (against £28,133 for 1928). From this the preference dividend is paid, reconstruction of tramway takes £1,040, and provision for expired capital outlay £14,962, leaving £760 to be carried forward. The decrease in receipts is attributed to depression in trade in the area served by the company.

German Issue in New York.

An issue of $20,000,000 of 6 per cent. bonds of the Rhenish-Westphalian Electricity Works was made in New York last week, and was heavily oversubscribed. The issue price of the bonds was 93 per cent., and they carry an option to take up shares of the company.

Greengate & Irwell Rubber Co., Ltd.

The net profit for the past year was £95,365 (as compared with £87,607). It is proposed to pay a final ordinary dividend of 1s. 6d. per share, making 2s. 6d. for the year (as for 1928), and to place £20,000 to reserve.

County of London Electric Supply Co., Ltd.

The directors have announced a final ordinary dividend of 8 per cent., less tax, making 11 per cent. for the year (10 per cent. in 1928).

South London Electric Supply Corporation, Ltd.

A final dividend of 5½ per cent., less tax, is recommended on the ordinary shares, making 8½ per cent. for the year (as for 1928).

Direct Spanish Telegraph Co., Ltd.

The dividend for 1929 on the ordinary shares is 8 per cent., free of tax (10 per cent. in 1928), including an interim distribution of 4 per cent. made in October last.

Indian Radio Telegraph Co.

A dividend of 12½ per cent., free of tax, is recommended on the ordinary shares for the past year.

Montreal Light, Heat & Power Consolidated.

A dividend of 60 cents per share has been declared on the common shares for the quarter ending March 31st.

Rangoon Electric Tramway & Supply Co., Ltd.

A dividend of 1 rupee 4 annas per share, free of Indian tax, has been declared on the ordinary shares.

Swedish Company.

The directors of the *Swedish L.M. Ericsson Company* are takings steps to prevent the control of the company passing into foreign hands, as a result of the purchasing of the company's shares which has recently been proceeding in Stockholm. The company has asked the shareholders to support the directors by placing in their hands proxies to vote at the company's meeting. Already sufficient proxies, the directors state, have been received to ensure an absolute majority, and it is expected that still other shareholders will associate themselves with the movement. It is pointed out by the company that its activity in recent years has experienced considerable development in different countries, and the company's competition is said to have been found inconvenient by certain other telephone companies operating in the world markets. During recent months comprehensive purchases of the company's "A" shares have been made. These shares carry voting rights, and although legally they cannot be owned by foreigners, the directors state that there is no doubt that they have been acquired with the object of transferring the control of the company to one of these foreign competitors.

German Companies.

The *United Aluminium Works Company* ("*Laytawerk*"), whose shares are indirectly in the hands of the German Reich, states that the turnover increased by 10 per cent. in 1929, despite the declining tendency of trade. The price of the metal remained at £95 per ton all the year, producers considering that a stable price policy is the best both in their own interest and in that of consumers. The net profits amounted to 3,760,000 marks, as compared with 4,610,000 marks in 1928, the dividend remaining at 9 per cent. on share capital of 24,000,000 marks.

The *North German Cable Works Co.*, of Berlin-Neukolln, proposes to increase its rate of distribution from 10 per cent. in 1928 to 12 per cent. for last year.

The *Electricity Supply Company*, Berlin, reports an increase in profits from 3,789,000 marks in 1928 to 4,329,000 marks last year. The dividend remains at 10 per cent.

The *Bergmann Electricity Works Co.*, Berlin, records net profits of 4,480,000 marks for 1929 against 4,481,000 marks in the preceding year. The rate of dividend is maintained at 9 per cent.

Czecho-Slovakian Company.

The net profits of the *Pressburg Cable Co.* are reported to amount to 6.15 million Czech crowns for 1929 or about the same as in the previous year. The rate of dividend is 12½ per cent., against 10 per cent. in 1928.

Stocks and Shares.

TUESDAY EVENING.

THE fall in the Bank Rate to 3½ per cent. last week fanned the flame of optimism which looks for a still further reduction, and a 3 per cent. minimum is confidently expected within the next week or two. The impression that money will become still cheaper is shared by leading members of the Government; and, in spite of City talk as to the likelihood of a big Reparations Loan being projected for issue in the early future, the outstanding feature of markets is the buoyancy shown by investment securities of all kinds. The gilt-edged lists have been outstandingly good. The amount of stock available for public absorption has rapidly diminished day by day, but the public appetite for such securities remains insatiable. Dealers in the investment markets report that their great difficulty has been to retain any stock on their books. They say that their principal task is to induce the buyer to take £5,000 stock when he wants £10,000, because the difficulty is to obtain stock with which to satisfy the insistent demand. The movement in gilt-edged stocks has spread over all classes of security, and, in our lists overleaf, it will be observed that the strength is very general. As a group, Home Railway stocks make the best showing. Electrical and cable equipment shares present a number of substantial advances. Every change this week in our price lists is upward, with the solitary exception of Telegraph Constructions. The shares have fallen £2, to 23, upon the issue of a very disappointing report. In spite of the heavy shrinkage in profits, the regular 10 per cent. dividend is maintained, thanks to the financial strength of the company. The salient figures were given in last week's ELECTRICAL REVIEW, page 554.

Insatiable Investment.

As a concrete illustration of the manner in which conditions have changed, it may be mentioned that Central Electricity Board 5 per cent. stock, which was on offer at 96½ last week, as mentioned here, has risen to 99. For months past there were blocks of the stock to be obtained at the former price, which showed a discount of 1 per cent. upon the issue price. Directly, however, investment inquiry started to look round for cheap stock, this scrip became immediately noticed, with the rest already mentioned. The twin stock, North-West Midlands Joint Electricity Authority 5 per cent., has risen 1½ to 98, and would probably stand at the same price as the Central Electricity were it not for the fact that the name is less well-known. About £5,000 County of London Electric 5 per cent. debenture stock can still be bought at 99, returning a yield of £5 1s. per cent. on the money.

London Electric Railway 4 per cent. debenture, in regard to which mention was made here last week of £3,000 being on offer at 77, cannot now be obtained under 81½, and the £2,000 preference which was available at 71½ has been taken. There is on offer at the moment £2,000 Central London 4 per cent. debenture at 81½, January and July interest, paying £4 19s. per cent. on the money, and £1,000 of the Metropolitan Railway new 3½ per cent. debenture at 69¾, which pays £5 0s. 6d. per cent. on the money; this latter can be bought free of stamp and free. The stock could have been purchased two or three weeks ago, in fairly substantial blocks, at 67½ or cheaper. London Power 5 per cent. debenture has risen to 99, which is a point higher than it was a week ago. Newcastle-on-Tyne 4½ per cent. debenture improved to 94½.

Amongst bonds and stocks not in the gilt-edged list, Tokyo sixes at 95 and Hungarian Trans-Danubian sixes at 83½ are both better; Perak Hydro-Electric 7 per cent. debenture hardened to 105½; the shares remain at 10s.

Home Railways Rise.

Underground Electric 6 per cent. income bonds have gained 6 points, with a rise to 112, and the shares are 1s. better at 23s. 6d. The company has just placed £500,000 of 5 per cent. first mortgage debenture stock, redeemable at 100 in May, 1963, or earlier at fixed rates at the company's option. The price of the stock started at 97, and there was a ready demand for the issue. Gains of 2 points have occurred in Central London ordinary assented stock at 75; of 2½ in Metropolitan consolidated at 65, and of 4½ in Districts at 77. The Tramway group is steady, and shows no movement at present. British Electric Traction deferred ordinary, which was quoted at 1,450 a few weeks ago, has risen to 1,625. The preferred ordinary put on a point, at 125½.

Home Electricity Supply Shares.

In the market for Home electricity supply shares, County of London ordinary responded to the increased dividend, which makes 11 per cent. for the year as against 10 per cent. in the previous twelve months, by a rise of 2s. 6d. to 47s. The new issue rose to a premium of 8s. London Electrics are 1s. 6d. better at 28s. 6d. Gains of 6d. to 1s. per share have occurred in a number of others. Metropolitan Electrics are ¼ up, at 41s. 3d. The North Metropolitan Electric 5½ per cent. debenture issue was covered many times over, and outside applications received microscopic allotments. Dealings started on Monday morning at a premium of 2½ per cent. over the issue price of 100. Later, it rose to 3 premium. The ordinary shares advanced to 48s. Of the provincial issues, Clyde Valleys are outstanding with a rise of 3s. 9d. to 38s. 9d. Bournemouth and Poole put on ¼, at 3½. Richmond (Surrey) shares at

45s. 6d. are a shilling higher. Egham & Staines remain at 34s. 3d.; and Isle of Thanet ordinary are better at 30s. ex dividend. Northamptons have moved up 1s. to 43s. 9d., Yorkshire Electrics to 33s. 9d. British Power and Light at 12s. 6d. are 1s. 6d. harder, and Atlas ordinary at 28s. show a gain of half-a-crown. The preference improved to 24s. 3d. It is expected that various power companies will be on the alert to turn to the best advantage the present appetite for investment shares, and that more capital issues may be offered shortly.

Cables and Wireless.

Fresh improvements have taken place in the stocks of Cables and Wireless, Limited. The preference naturally came into demand by reason of the investment excitement, and the price rose to 99, showing a gain of 2½ points. The "A" ordinary is equally better at 65, and the "B" ordinary at 33½ shows an improvement of 3¼. At these prices, the equivalent of Eastern Telegraph ordinary stock comes to about 242½, making the shares of the two other companies—Eastern Extension and Western Telegraphs—equal to 24½. An important debate was expected to take place in the House of Commons early this week on the question of the Beam system, when further details were to be extracted, if possible, from the Post Office as to why the latter gave the cold shoulder to the Imperial Merger in favour of the American system. American Telephone and Telegraph ordinary stock at 255 is 10 points up, and International Telephone and Telegraph at 66 is 1½ down on the week. In sympathy with the rise in Cables and Wireless, Globe ordinary rose to 22 ex dividend, equal to an improvement of 15s. on the week. The preference shares at 11½ have recovered the dividend taken off the price last Thursday, the Stock Exchange pay-day. Marconi Marines improved to 2½. In the Anglo-American stocks, improvements have occurred in the preferred and deferred. There has been inquiry for Automatic Telephones, the price of which rose to 38s. 9d. Nothing fresh has transpired in the shares of the Telephone Manufacturing (1929) or Telephone Rentals issues, the prices of which remain at 9d. and 3s. 6d., respectively. Great Northerns at 31½ are a point higher on the week, and of the prior-charge stocks, Eastern Telegraph 3½ per cent. preference improved to 65½.

Manufacturing and Equipment Shares.

There is a long catalogue of rises in the list of shares in manufacturing and equipment companies. These rises are for the most part important, there being a gain, for instance, of 6s. 3d. in Callenders at 3½, while British Insulated at the same price are 3s. 9d. higher. Henleys rose 6s. 3d. to 6¾, Enfields are 5s. better at 97s. 6d. Johnson & Phillips rose to 27s. 6d., Associated Electric ordinary advanced 4s. to 29s., this being assisted by American buying. British Aluminium gained 2s. 3d., with a rise to 45s. 6d. The Crompton Parkinson shares, ordinary and preference, are ex dividend, and show small improvements. India Rubber ordinary went up 9d. to 10s. 9d., the preference to 13s. 9d., and the 5 per cent. debenture to 94½. The rises in this market were due to a number of inquiries which found, upon coming to deal, that there was very little stock to be obtained. It will be noticed from our catalogue of yields in the final column of our table that the returns offered by the best-class manufacturing companies' shares are extremely modest. This consideration, however, goes for very little, anticipation looking to the future for the prospect of reward in the shape of new issues which will offer a bonus.

Dollar Stocks.

Montreal Light and Power at 140 show a gain of 2½ points. Shawinigan Water recovered to 78. Power Corporation of Canada rose 1 to 75½, and Hydro-Electrics at 49 are 2¾ to the good. International Holdings have been quiet, the price remaining about 6¼. A lot of business is doing in Brazilian Tractions, the shares spurting sharply by reason mainly of a substantial improvement that occurred in most Brazilian issues, more particularly those of the Government class. Talk of a probable loan from Brazil has brought about a complete change in the manner in which Brazil has lately been regarded, and the utilities have risen with the rest, Brazilian Tractions at 45 being 4½ points up. The preferred shares have strengthened to 130 ex dividend. The Mexican issues have scarcely participated: in fact, Mexican Light and Common shed 4 of its 8¼ points rise of a week ago. Mexico Trams are 23½ after being lower. The bonds and other prior-charge issues in this department display noticeable firmness, though here again, the endeavour of the prospective purchaser to acquire stock is frequently frustrated by the scarcity of the floating supply.

Miscellaneous Matters.

Vickers have issued their annual report, showing therein figures which are distinctly better than had been anticipated, and pointing to the fact that the company is getting fairly on its feet. The shares, which are of the nominal value of 6s. 8d. each, have risen to 9s. The dividend is maintained at 8 per cent., but, as indicated, the figures are very encouraging. They had their effect upon other members of the iron and steel group. Babcock and Wilcox rose to 60s. The rubber market remains placid. An effort was made early this week to infuse a little activity into the list, but the public are too greatly engrossed with other markets for rubber shares to attract any particular attention, although the determination to cease tapping during the month of May has received cordial support from a large number of companies, Dutch as well as British.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Approx. Dividend. 1927.	1928.	Price Mar. 25 1929.	Rise or fall	Yield p.c.
Bournemouth and Poole	1	15	15	3½	+⅛	4 16 0
Brompton Ordinary	1	8½	8½	25/6	—	5 9 10
Charing Cross Ordinary	1	8½	8½	25/6	—	5 7 8
do. do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	8½	8½	25/-	—	5 12 0
City of London	1	10	10	23 3	+1/16	4 4 1
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	23/9	+3/16	4 2 6
County of London	1	7	10	47/-	+⅛	4 5 1
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's 7% Pref.	1	7	7	24/-	—	5 16 8
Elec. Supply Corporation	1	11	11	45/9	—	4 13 7
Kensington Ordinary	1	8	8	26/-xd	-	5 7 9
Lancs. Light and Power	1	7½	7½	27/	—	5 11 1
London Electric	1	8½	9	28 6	+1/8	4 18 8
Metropolitan	1	9	10	41/3	+⅛	4 17 0
do. 4½% Pref.	1	4½	4½	17/6	+6d.	2 10 0
Midland Counties	1	6½	7	29/-	+1/-	4 6 7
Mid. Elec. Power	1	15	8	32/6	-	4 18 6
Newcastle-on-Tyne Ordinary	1	6	6	24 6	+9d.	5 1 1
do. 7% Pref.	1	7	7	25/6	—	5 9 10
Notting Hill 6% Pref.	10	6	6	10 2	—	5 11 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	1	8	8	26/3	+6d.	5 5 8
Scottish Power	1	8	8	30/-	+1/-	5 6 8
South London	1	8½	8½	27/-	—	5 8 8
Urban Ordinary	1	7	7	23 9	—	4 2 10
Westminster Ordinary	1	8½	8½	25/-	—	5 13 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/6xd	+1/-	6 2 5
Yorkshire Elec.	1	8	8	28/9	+1/16	4 14 8

Home Rails.

		Nom. £	Approx. Dividend. 1927.	1928.	Price Mar. 25 1929.	Rise or fall	Yield p.c.
Central London Ord. Assented	Stock	4	4	75	+2	5 6 8
Metropolitan	"		8½	4	65	+2½	6 8 1
do. District	"		4	5	77	+4½	6 9 10
Underground Electric	£1		7	8	23/6	+1/-	6 16 2
do. do. Income	Bonds		6	6	112	+6	5 7 2

Telegraphs and Telephones.

		Nom. £	Approx. Dividend. 1927.	1928.	Price Mar. 25 1929.	Rise or fall	Yield p.c.
Anglo-Am. Tel. Pref.	Stock	6	6	102½	+1	5 17 1
do. Def.	"		1½	1½	24½	+⅜	6 2 5
Automatic Telephone		1	10	12½	38/9	+1/16	6 8 0
Cables & Wireless 5% Pref.	Stock	—	5½	99	+2½	5 11 0
do. A 7½ Ord.	"	—	—	65	+2½	... ...
do. B Ord.	"	—	—	34½	+3½	... ...
Globe Tel. and T. Ord.		10	10	10	22xd	+½	*4 11 0
do. do. Pref.		10	6	6	11½xd	+⅛	5 9 1
Great Northern Tel.		10	20	20	31½	+1	6 7 0
Marconi-Marine		1	12½	15	2½	+1/16	6 13 4
Oriental Telephone Ord		1	12	12	24½	—	*4 5 5

Home and Foreign Trams, &c.

		Nom. £	Approx. Dividend. 1927.	1928.	Price Mar. 25 1929.	Rise or fall	Yield p.c.
Anglo-Arg. Trams First Pref.		5	5½	5½	8	—	3 4
do. do. 2nd Pref.		5	6	6	8 1/16	—	9 16 0
do. do. 5% Deb.	Stock	5	5	70½	—	7 1 10
British Electric Traction Def. Ord.	"	6	5	162/5	+2/3	...
do. do. Pref. Ord.	"	8	8	145½	+1	6 7 6
Brazil Traction	100	7	8	45	+1½	4 9 0
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	91½	—	5 9 8
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/-	—	... ...
London United Tram Deb.	Stock	4	4	52½	—	7 13 4
Mexico Trams, 5% Bonds	—	5	5	64½	—	7 15 0
Mexican Light Common	100	Nil	Nil	7¾	+4½	... ...
do. 7% Pref.	100	7	7	78½	—	9 5 6
do. 1st Bonds	—	5	5	76	—	6 11 7
Victoria Falls Ord.	1	15	15	2⅞	—	5 4 4
Yorkshire (West Riding)		Nil	Nil	4/3	—	... ...

Manufacturing Companies.

	Nom. £	Approx. Dividend. 1927.	1928.	Price Mar. 25 1929.	Rise or fall	Yield p.c.
Assoc. Elec. Ord.	1	6	—	29/-	+4/-	4 2 9
Babcock & Wilcox	1	15	15	3		*5 0 0
British Aluminium Ord.	1	10	10	45/6	+2/3	4 8 0
British Elec. Transformer Pref.	1	7	7	10/-		
British Insulated Ord.	1	15	15	3½	+1/16	8 17 6
Brush Ord.	Stock	10	10	136½		7 18 1
Callenders	1	15	15	3½	+1/16	8 17 6
do. 6½% Pref.	1	6½	6½	2/9		5 9 5
Crompton Parkinson Ord.	5/-	—	20	x2 6xd	+6d.	6 13 4
do. 8% Pref.	1	8	8	25/ xd	+1d.	6 8 0
Edison-Swan 1st Pref.	1	7½	7½	24/6	-	7 1 1
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	8½	1 1/3	—	9 18 6
Enfield Cable Ord.	1	20	20	4½	—	4 2 0
English Electric	1	Nil	Nil	3/9	—	... ...
do. do. Pref.	1	8	Nil	7/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/-	—	5 13 1
do. Ord.	1	10	10	3 1/16	—	4 6 7
Henley	1	25	30	£3	+1/4	4 13 6
do. 4½% Pref.	5	4½	4½	4½	—	5 0 0
India-Rubber	1	Nil	Nil	10/9	+9d.	... ...
Johnson & Phillips	1	10	—	27/6	-1/16	5 6 8
Siemens Ord.	1	7½	7½	23/9	—	6 6 2
Telegraph Construction	12	10	10	23	-2	*5 4 2

*Dividends paid free of Income Tax.

The B.E.A.M.A.

The Council's Annual Report for 1929.

WE have received from the British Electrical and Allied Manufacturers' Association the Council's report for the past year.

This expresses the Association's regret at the death of Dr. S. Z. de Ferranti, and the retirement, through ill-health, of Mr. F. H. Nalder, who had served on the Council since B.E.A.M.A.'s foundation. Mr. A. F. Harris (Nalder Bros. and Thompson, Ltd.) has been appointed in his place. Lt.-Col. K. Edgecumbe and Lt.-Col. R. K. Morcom, C.B.E., accepted office as vice-presidents during the year.

During the year the Council set up an Unemployment Committee to confer with the Government; so far it has only had time to make preliminary investigations. Three sections of the Association are preparing applications to the Board of Trade under the Merchandise Marks Act, 1926, for an Order requiring the marking of certain classes of imported goods with an indication of their origin. The Council has recommended the sections to adopt the general principle of inter-trading between members, and a simple form of agreement has been approved by the Council to place before the sections.

Dealing with trade conditions during the year, the report says that in many ways the economic position was unsatisfactory. Orders received for purely industrial installations on home account were less than in any year since 1924. On the other hand, the Central Electricity Board placed contracts in connection with five new schemes. Though it is estimated that the Board has placed orders for more than eleven million pounds' sterling with electrical manufacturers, since it definitely began operations, only a small number of branches of the industry participated in the resulting work—those chiefly concerned with the manufacture of cables and transmission equipment, control and switchgear, and transformers. In generating plant, activity on home account was decidedly sub-normal, largely owing to the incidence of the transition period which preceded the new schemes of expansion. On balance, therefore, the industry was not producing at more than its normal volume for home account. In exports, on the other hand, the decline which had set in during the autumn of 1927 and continued throughout 1928, came definitely to an end at the beginning of 1929, and new records were established in the heavy engineering sections. The most active markets were to be found in Europe, especially in Russia and Holland, but the Dominions were beginning to emerge from the stagnation which characterised trade during 1928, and were once more (in Australia especially) embarking on extensions of industrial and power equipment. In South America the demand for British electrical products was sustained without marked fluctuation, but it is doubtful whether an improvement will set in during 1930, owing to financial conditions. India continued its programme of industrial expansion; while the Malay States showed a tendency to slow down after the very important developments of the last three years. Considering foreign overseas markets as a whole, the most active area was Europe, which showed a marked expansion. Owing, however, to the effect of reparations deliveries-in-kind, this market has tended to become more a German preserve. It is significant, however, that the British electrical manufacturers, in spite of difficulties beyond their control, have been able to extend quite considerably their range of operations.

Among movements in the general economic and political field which affect the prospects of electrical manufacturers are the following:—The almost complete cessation of foreign lending on the part of this country. Since, in previous years, such lending, so far as electricity supply was concerned, took the form of financing undertakings either in Germany or within the control of German manufacturers, this may have unfavourable effects on the expansion of German electrical manufacture. The adjustment of the question of reparations deliveries-in-kind (in which the Association took a leading part) in such a way that it will be almost impossible for the German manufacturers in future to use this channel for the expansion of their electrical export trade. The change in the attitude of the central bank towards industrial development, from which it would appear that a real effort will now be made to finance the reorganisation and re-equipment of our basic industries. Each of these developments must in themselves have a favourable effect on the prospects of electrical manufacture and will serve to adjust the international competitive position. The prospects for the next three years are decidedly better on home account than they have been for some time, but competition has become so intense in overseas markets that any considerable expansion of export shipments would be a matter for congratulation.

During the year the Central Electricity Board adopted, with but slight amendment not affecting essentials, the standard set of heavy-plant erection conditions published by the Institution of Electrical Engineers. The Irish Free State Electricity Department has gone some way in the same direction. Other large purchasers have adopted the I.E.E. text as standard; and several who had already adopted it with amendments have ceased to amend. The Solicitor's report on the adoption of the standard fair wages clauses is satisfactory. Reference is made to the unsatisfactory nature of annual contracts for supplies, and to the happy relations existing between the members of the I.M.E.A. and the Association.

The Standardisation Committee has been fully occupied during the year in allocating, reviewing, and co-ordinating the standardising work of the various sections of the Association and in checking and passing the final proofs of no fewer than forty-two specifications, as they came from the B.E.S.A. for approval. Particulars of the work carried out are given, and it is mentioned that the American Institute of Electrical Engineers awarded to a member of the Standardisation Committee, Mr. A. B. Field, its first Lamme gold medal.

In connection with the proceedings of the Royal Commission on Transport, the Traffic Committee collaborated with other associations in preparing evidence on general questions and also submitted, independently, a reasoned statement of its own on the transport of heavy and bulky pieces of machinery. The weight and size of electrical machinery have increased far beyond the loading limits of the railways, and it is necessary to transport by road considerable quantities of such machinery which might be carried by rail if certain facilities suggested by the Committee were provided by the companies.

During the past year the railway companies have acceded to insistent requests by the members to restore the half-rate concession on certain types of machinery when returned to the makers' works for repair, and, as a result, armatures, generators, rotors, stators, and transformers are now re-included in this arrangement. The Association has become an affiliated member of the Australian and New Zealand Merchants' Association, thus making it possible to keep in closer touch with Australian freights and shipping conditions. The Education Committee reports that the number of students in members' works at the close of 1929 was 243, an increase of 35 over the number at the close of 1928. The countries sending the largest numbers were, in order of numbers: India, Africa, Egypt, Australia, New Zealand, China, South America, British Guiana and West Indies, Spain, France, Canada, Tasmania, Japan, and Russia. An important part of the earlier work of the Committee, in addition to the scholarship scheme, was aimed at gradually bringing about the general acceptance by members of the standardised methods of training apprentices and men from overseas, and no material changes in either method or general principle have since been made necessary by the many changes in industry. On the other hand, the national system of education is now bringing into being many activities that have a bearing on industrial conditions.

Dealing with export matters, it is stated that on a report from the Department of Overseas Trade, submitted by the Export Committee during the year, describing the propaganda of foreign industries in the British Colonies, the Publicity Department was given *carte blanche* to engage in similar propaganda, and is now so engaged. The Council continued its membership of the Australian Association of British Manufacturers. One of the vice-presidents, Sir Hugo Hirst, Bt., was a member of a British Economic Mission to Australia.

The Export Committee proposed to the New Zealand Public Works Department that it should adopt, in substitution for the Department's conditions, the texts of the Institution of Electrical Engineers, B1 and B2. The matter is now under discussion.

During 1929 the Economic and Statistical Department was specially active in correlating statistics and information bearing on the British electrical industry, and the results of its labours during the year were incorporated in the monograph, "The Electrical Industry of Great Britain."*

During the autumn, a number of special campaigns took place, with a view to reviving interest in electrical development and electrical industry, and a special debate on electricity supply which took place in Parliament towards the end of the year showed how interest had been stimulated by the activities of the Department. Special articles were, as usual, contributed to a large number of journals, operating in important markets in the Dominions and in Europe.

The report of the British Electrical Development Association is dealt with. This is abstracted elsewhere in this issue. Mention is also made of the work of the E.R.A., the International Steam Tables Conference, and the World Power Conference.

The attention of members was drawn during the year to the difficulty of working the Exhibition Rule as a result of members' branch offices committing their firms to support local exhibitions without first having ascertained whether the exhibition was "free" or had been "opened" by the Council. A number of exhibitions were "opened" by the Council during the year.

* ELEC. REV., November 29th (p. 966) and December 6th, (p. 1013).

Electrical Imports of Peru.

Figures for 1927 and 1928 Compared.

THE following figures show the values of the imports into Peru of electrical goods and apparatus in 1928. Comparative figures for 1927 are also given, together with a note of increases or decreases. The Peruvian £=about 20s.

	1927. £P.	1928. £P.	Inc. or dec. £P.
Electrical accessories, e.g., switches, cut-outs, plugs, lampholders—			
Total	20,700	25,000	+ 4,300
From Germany	6,400	11,300	+ 4,900
,, Great Britain ...	1,200	1,500	+ 300
,, United States ...	9,100	8,400	- 700
Accumulators and batteries—			
Total	22,200	18,200	- 4,000
From Germany	800	800	—
,, United States ...	17,600	24,000	+ 6,400
Insulators and tubes—			
Total	15,000	14,300	- 700
From Germany	1,800	2,800	+ 1,000
,, United States ...	10,000	9,500	- 500
,, Great Britain ...	2,300	1,800	- 500
Copper wire, covered, except with silk, up to 3 mm. in diam.—			
Total	13,700	13,500	- 200
From Germany	2,600	3,800	+ 1,200
,, United States ...	7,500	6,300	- 1,200
,, Great Britain ...	1,000	2,100	+ 1,100
Ditto more than 3 mm. in diam.—			
Total	14,000	18,000	+ 4,000
From Germany	2,400	5,400	+ 3,000
,, United States ...	8,800	7,800	- 1,000
,, Great Britain ...	700	600	- 100
,, Italy	500	3,800	+ 3,300
Covered copper flex—			
Total	2,900	6,100	+ 3,200
From Germany	1,400	4,500	+ 3,100
,, United States ...	500	200	- 300
,, Belgium	100	200	+ 100
Telegraph apparatus, including wireless—			
Total	15,000	19,700	+ 4,700
From United States ...	3,300	2,400	- 900
,, Great Britain ...	11,500	16,100	+ 4,600
Telephone apparatus—			
Total	6,500	6,300	- 200
From United States ...	3,200	3,200	—
,, Great Britain ...	1,500	800	- 700
Wireless telephone apparatus—			
Total	*	4,800	—
From United States ...	*	2,400	—
,, Sweden	*	1,500	—
Lighting fittings—			
Total	14,000	23,000	+ 9,000
From Germany	8,000	13,500	+ 5,500
,, United States ...	2,300	5,400	+ 3,100
,, France	1,400	1,200	- 200
Heating and cooking apparatus—			
Total	8,300	17,500	+ 9,200
From Germany	900	1,800	+ 900
,, United States ...	2,500	12,000	+ 9,500
,, Belgium	3,500	2,300	- 1,200
Cables, copper—			
Total	92,900	31,000	-61,000
From Germany	27,000	5,200	-21,800
,, United States ...	8,000	9,700	+ 1,700
,, Italy	17,000	3,200	-13,800
,, Great Britain ...	28,000	1,400	-26,600
Electric bells—			
Total	1,100	1,400	+ 300
Insulating tape—			
Total	2,100	2,500	+ 400
Meters and instruments—			
Total	3,200	4,400	+ 1,200
From Germany	500	900	+ 400
,, United States ...	1,500	2,300	+ 800
Metal filament lamps—			
Total	41,000	47,000	+ 6,000
From Germany	18,800	23,300	+ 4,500
,, United States ...	12,000	7,500	- 4,500
,, Holland	6,400	9,000	+ 2,600
Magnetos—			
Total	1,500	1,300	- 200
From Germany	400	100	- 300
,, United States ...	800	1,000	+ 200
,, Great Britain ...	300	100	- 200
Electric light meters, domestic—			
Total	14,000	6,300	- 7,700
From Germany	13,700	5,500	- 8,200
Motors up to 1 h.p.—			
Total	2,200	2,800	+ 600
Switchboards—			
Total	28,000	10,700	-17,300
From Germany	2,200	2,700	+ 500
,, United States ...	24,000	5,300	-18,700
,, Great Britain ...	1,200	300	- 900
Fans—			
Total	2,800	2,200	- 600
From Germany	200	300	+ 100
,, United States ...	1,300	1,600	+ 300
,, Italy	850	100	- 750
Current transformers—			
Total	34,000	21,500	-12,500
From Germany	4,000	6,900	+ 2,900
,, United States ...	27,000	13,700	-13,300
,, Great Britain ...	2,900	300	- 2,600
Total of electrical goods and apparatus	391,000	321,000	-70,000
From Germany	98,000	94,000	- 4,000
,, United States ...	164,000	136,000	-28,000
,, Great Britain ...	56,000	33,000	-23,000
,, Italy	24,000	23,000	- 1,000
,, Belgium	—	11	+ 11
,, Sweden	—	6	+ 6

* Not specified.

Wiring in Northern Ireland.

The "Jerry" Contractors' Harvest.

By P.T.W.

OUTSIDE Belfast, and possibly in it for all that can be ascertained at present, a new type of wiring contractor and wireman is being evolved. They seem to qualify for the business in a few months and they are rapidly spreading themselves over the towns of Northern Ireland. From all appearance they are doing a rapid trade. In some measure this may be due to the introduction of surface systems and their ease of installation, but this cannot altogether account for them. It is certainly not due to any of the various activities of the technical schools. The type of operator referred to has no respect for the technical school or anything that they can teach him there.

Whatever it may be due to, the "snowball" electrician is rapidly growing in numbers in the towns and villages. He evolves, so to speak, in the following curious way. As soon as a supply is available in any town the new type of contractor appears in it. In a short time he appears to have a goodly number of the local young men and lads working for him. A few months of this experience appears to be all that is necessary to justify *their* existence in the trade, either as master or man. So far as can be observed they seem to confine their operations to house and shop wiring, with a little "wireless" thrown in. They have some sort of "rule of thumb" as to "lamps per gauge" for conductors, but the main thing is that they are able to get their work passed by the supply authorities: otherwise they would not be long in the business.

How do they get their supplies? Well, there is no difficulty in the way of any one setting up as a contractor. If he has a shop or place of business the suppliers recognise him. That appears to be the only test applied to him; after that he has to justify himself by remaining in business if he can. He works at a cheap rate even when business is ready to hand, but when the competition of his type becomes desperate, as it is bound to do at times, he will take anything.

How do the regular trade contractor and his staff react to him? Naturally he is a worry and a puzzle to them, but there is really nothing they can do to eliminate him. They cannot compete at his prices, so he gets the work, and this is, of course, the main thing. The customer takes it that his connection to the supply is sufficient guarantee as to the workmanship and the materials employed, and that is quite enough to satisfy him. Why should he pay more for what appears to him to be the same thing? It is true that some engineers of electricity supply systems notify the public generally that beyond making an insulation test and a more or less casual inspection they are assuming no responsibility. There is no one in a position to compel them to do more. Their chief concern seems to be to get a load as quickly as possible, and the new craftsman comes in handy.

What are the trade unions doing about it? So far as the writer can see no representations have been made to the supply authorities in the matter, and the union representatives are quite indifferent as to the activities of our new friend.

When, however, his scope of operations extends to more serious work than house wiring he may become really dangerous. He is ready to take on anything. With the passing of the old-time consulting engineer—a fine type—all the old restrictions and safeguards against incompetence and scamping are so far removed from present-day practice that for all practical purposes they may be regarded as having ceased to exist. With the exception of a protest here and there the regular trade appears to have done nothing. It is realised that drastic measures are called for; possibly even at the moment something is being done, but, if so, no one knows anything about it.

The Electrical Development Association.

The Annual Report, Meeting, and Luncheon.

Annual Report.

THE report of the E.D.A. Council for 1929 commences with a reference to the passing of Dr. S. Z. de Ferranti, the president, and Sir John Gatti, the immediate past-president. It is stated that there was marked progress in all branches of the Association's work, the membership increased, and three new provincial area committees were established. There was a net increase of 143 in the membership, 29 of which were electricity supply undertakings, and eight undertakings adopted an increased rate of subscription. There are now nine area sub-committees and the increased membership and annual subscription is largely due to their work.

The report deals briefly with the work of the nine sub-committees which deal with particular subjects. The Industrial Heating Sub-Committee organised an exhibition at Manchester early in the year and participated in the Bradford Engineering Society's Exhibition. Reference is also made to the Rural and Agricultural Electrification, Refrigeration, and Exhibition Advisory Sub-Committees. The last-named, apart from assisting in the arranging of local exhibitions, undertook the complete organisation of electrical exhibitions at Ealing, Torquay (I.M.E.A. Convention), and Brighton. A conference was held at last year's British Industries Fair, while the Sub-Committee made arrangements for the E.D.A. display at Birmingham this year. Successful results were secured from the Association's kinema theatre and bureau at the North-East Coast Exhibition. A good exhibit was arranged at the Smoke Abatement Exhibition, Manchester, in November last, with the aid of supply undertakings in the area. In July the Director reported on proposals made by the late Dr. de Ferranti with the result that a special committee was set up to prepare a report on the possibility of securing the general adoption of a two-part tariff, as uniform as possible, with a low running charge and a standing charge varying to suit local conditions; the service and facilities which supply undertakings should offer to the public; and the steps which could be taken to encourage undertakings to adopt any recommendations made under the foregoing. One meeting of the Committee has been held. Another special committee has been set up to examine the subject of domestic water-heating and other uses of electricity with a view to the preparation of reports for the information of the industry, &c. Other activities concerned the subjects of ultra-violet rays and electric vehicles. During the year a report upon the Factory and Workshop Lighting Campaign was issued, and the E.D.A. national advertising programme for 1928-29 was completed, one feature of which was the issue of monthly sales and publicity programmes, forming a valuable link between the national advertising and that of individual undertakings.

The E.D.A. Electric Homes (Outlet) Campaign was launched in September last after several months of preparation. Prior to this a special committee was established to work in close collaboration with the area committees and constituent associations, and it has been responsible for all Campaign activities to date. The campaign opened with the issue of 4,600 copies of the programme and of a 16-page booklet (E.D.A. 800) entitled "The House You Want." At the end of the year the first edition of the booklet (300,000) was practically exhausted, and a second edition was put in hand. The committee also prepared an "Electric Homes Wiring Specification," and circulated a draft to the area committees and constituent associations. At the date of the report general agreement upon all the provisions and clauses had been secured and the specification had been adopted by the Council. It was also recommended that demonstration houses wired in accordance with the specification should be organised and a number of such houses are already in preparation. Joint conferences with the Electrical Association for Women have been held in several centres and a large number of Campaign lectures have been delivered. The Campaign has led to increased activity in connection with the distribution of special publicity literature, poster advertising, showroom window displays, &c. It is intended that the Electric Homes (Outlet) Campaign shall be established as a permanent activity, or, at least, that it shall be carried on for a number of years.

Mention is made of the Salesmanship Conferences of the 1929-30 session in London, and it is recorded that similar conferences have been organised in Newcastle, Manchester, Bradford, Leeds, Cardiff, and Bristol. The Association has been very successful in securing editorial mention in newspapers, and now a regular editorial Press service has been instituted, fortnightly articles being circulated for the use of newspapers. Mr. G. S. Francis, of the E.D.A. staff, delivered 147 lectures during the year to societies of many descriptions, and at exhibitions. Special lectures for architects and domestic science teachers were given. It is estimated that the audiences at these lectures reached a total of 10,000.

Among other miscellaneous activities of the Association reference is made to the E.D.A. films; the conference of representatives of electricity supply associations with the Lord Privy Seal and the Minister of Transport regarding the relief of unemployment; the broadcast talk by Sir Oliver Lodge on "The History of Light"; the British Indian Electric Committee; electricity in schools; and the sale of literature and window displays. About two-and-a-half million pamphlets, &c., were circulated, and 47 new publications were issued.

Considerable space in the report is devoted to the activities of the Electrical Association for Women. During 1929 this Association formed six new branches and two more were established early this year; there are now 22 branches. An outstanding event was the conference held at the North-East Coast Exhibition in July. The E.A.W. has been active in the directions of the Outlet Campaign, electricity in the schools, and the assistance of women builders, architects, and house decorators in electrical matters.

The E.D.A. accounts show that the annual subscriptions rose from £29,727 to £30,974, while the special subscriptions fell from £7,650 to £1,000; thus the total income was £5,403 lower at £31,974. This was contributed as to 70.9 per cent. by electricity supply undertakings, 26.4 per cent. by manufacturers, 2.2 per cent. by contractors, and 0.5 per cent. by wholesalers. The decrease was entirely due to the reduction in subscriptions for special purposes from manufacturers. The report concludes by stating that every electricity undertaking and firm in the industry is benefiting from the work of the Association, whether a subscription is being paid or not; non-subscribers are in fact receiving benefits for which others have paid. The Council makes an earnest appeal for the support of all supply undertakings, and all manufacturing, wholesale, and contracting firms.

Edwin Hadley] *[Nottingham.*

Alderman E. Huntsman,
President of E.D.A., 1930-31.

Annual Meeting and Luncheon.

This year the Association held a luncheon at the Savoy Hotel, London, on March 21st prior to its annual general meeting; the attendance at the meeting was the largest for several years. The proceedings at the annual meeting are private, although representatives of the technical Press are invited by courtesy to attend. We cannot therefore report what took place beyond announcing that Alderman E. Huntsman, of Nottingham, was elected President for the coming year, and Mr. H. Marryat was elected Chairman of the Executive Council. As at the luncheon, a tribute was paid to the late Dr. S. Z. de Ferranti (the President) and expression was once again given to the great loss which the electrical industry as a whole had suffered by his death.

The attendance at the luncheon numbered over 400. The toast list was as short as it could well be, consisting only of the toasts of "His Majesty the King" and of "The Electrical Development Association."

The latter toast was proposed by Mr. Herbert Morrison (Minister of Transport) after Captain J. M. Donaldson, M.C. (chairman of the Executive Council), who presided, had explained that it was owing to the lamented death of their late president, Dr. de Ferranti, that he occupied the chair.

Mr. Morrison, in a speech which contained many solid facts presented with some touches of humour, after referring to the advantages of advertising, said that although the quantity of electricity sold in this country had grown from 3,600,000,000 kWh in 1922 to 7,600,000,000 kWh in 1928, we were still much behind the United States, where the total output in 1928 was 97,000,000,000 kWh. It was claimed that 68 per cent. of the population of the United States were living in electrified homes, that 500,000 farms were electrified and that three-quarters of all power in industry was electrical. On the other hand, it was estimated that in Great Britain only 18 per cent. of the houses were wired, that not one of these was completely electrified, and that the present output represented only 15 per cent. of the possible home field. If British consumption was to reach a level corresponding to that of the United States, our annual output should be 30,000,000,000 kWh instead of the probable 8,500,000,000 kWh for 1929. Whilst conditions in Great Britain and America might not be fully comparable, there were two things needed in the British electrical industry. One was a universal and scientific push by all the supply undertakings instead of by only some of them, and the second was a really wholehearted publicity campaign conducted on a national scale. It was the duty of all supply undertakings to see that they were adequately equipped with a sales organisation which not merely preached the virtues of electricity but was also a service organisation ready to give the consumer the best advice and assistance. Speaking of the valuable propaganda work being done by the E.D.A., Mr. Morrison expressed satisfaction at hearing that an increasing number of supply undertakings were becoming associated with the organisation, but he urged all those outside to come in. Moreover, he appealed on behalf of the Association to all branches of the industry to support the work that was being done, and after warmly congratulating the Association on what it is doing he promised the industry as a whole the full support of the Central Electricity Board, the Electricity Commissioners and the Ministry of Transport to enable the work of such organisations as the E.D.A., to become even more effective than it had been, with the object of establishing a great nationally organised industry. Reference was made to the steady progress in the application of electricity to railways and to the appointment of the committee under the chairmanship of Lord Weir, and finally, as one who had a home in which electricity was installed for all purposes, Mr. Morrison again spoke of the many ramifications of the use of electricity especially in the domestic field, and emphasised his own determination and that of the Government to do everything possible to forward the interests of the electrical industry, which was one of the bright spots of British industry at the present time.

Responding to the toast, Mr. R. P. Sloan first referred to the death of Dr. de Ferranti and to his wonderful optimism and enthusiastic belief in the future of electricity. He said that the fact that the Minister of Transport lived in an all-electric home made his views upon domestic electrification carry much more weight than they otherwise would do. With regard to the national scheme, Mr. Sloan said that it was only fair to state that it was really only anticipating a development that would have taken place in any event, although it might have taken a good many years. Already on the North-East Coast they had shut down 15 small and inefficient supply stations irrespective of the national scheme altogether. If the national scheme was to be a success, however, there were two main requirements: one was that generating costs must be reduced, and the other, that consumption must be increased. The first was very largely in the hands of the Central Board which, whilst it had a difficult problem, was in the position of being able to find the money comparatively easily and also of having the advantage of one central control. Increased consumption depended upon the efforts of a large number of distributors scattered all over the country; while the various undertakers responsible for distribution were represented in a number of associations there was only one Association in which they could all be represented, and that was E.D.A. There was no time when it had been more important for wholehearted support of the Association than at present. The national scheme had introduced an entirely new set of circumstances. At the same time it should be remembered that the industry had to meet the cost of the more rapid development that was taking place, and therefore in order that it should be a success it was essential for all engaged in distribution to co-operate together in order to secure the greatest possible increase in consumption. The estimates for the national scheme had been based on figures which were greatly in excess of the present consumption per head, and unless some such result could be achieved, then a reduction in generating costs alone would not make the scheme a success. It was for this reason that he urged every interest in the industry to support the work of E.D.A. and not to allow the present position to continue in which many were reaping the benefit from money provided by others. It was impossible for the Association to do its work adequately without proper financial assistance, and it was for this reason that he urged all sections of the industry to contribute their fair share.

How to Sell Electricity.

The Sixth and Last E.D.A. Salesmanship Conference of the 1929-30 Season.

At the last of this session's E.D.A. Salesmanship Conferences, which was held at the Royal Society of Arts on March 20th, the subject for discussion was decided upon by the conference itself, and Lieut.-Colonel W. A. Vignoles (the Director and Secretary of the Association) opened a discussion on the selling policy and practice of electricity supply undertakings. Mr. A. C. Cramb (borough electrical engineer, Croydon) presided and pointed out, in the first place, that at the moment there was inefficient selling in the industry.

Lieut.-Colonel Vignoles distinguished between an ordinary business which existed merely for the purpose of making profits, and the electricity supply business. Supply undertakings, he pointed out, were marketing a public commodity, and those responsible for their conduct should not merely seek a good return on the capital invested and plod on without seeking to expand. They must serve the public to the best of their ability, whilst maintaining a reasonable return on the capital invested. If they adopted this policy of developing sales to the greatest possible extent by selling cheap energy at a small profit, they must provide the capital required for constant expansion, including capital for financing assisted wiring schemes and for the financing of schemes for enabling consumers to obtain apparatus on hire and hire-purchase terms. It had been proved in many instances that the policy of reducing prices had increased profits as the result of greater turnover, and many of the undertakings which adopted this policy were in a sound financial position. In every undertaking, except possibly the very smallest, there should be a sales manager or engineer responsible to the general manager, and he should be given adequate assistance to cope with the business of his department. In a large undertaking the sales manager would require assistants to deal with the consumers' department, the sale and hire of apparatus, assisted wiring, installation work, and publicity. The consumers' department would have the responsibility of canvassing, and would deal with problems concerned with tariffs, the development of new uses for electricity, and all commercial problems connected with its use. Problems connected with the sale and hire of apparatus would possibly be within the responsibility of the showroom manager. It would have to be decided whether the undertaking should sell direct to the public or through a contractor, and there were other problems, such as whether or not the rentals for hired apparatus should be designed to cover the entire cost of the apparatus and its maintenance, or whether the undertaking was to charge low rentals and depend upon securing an adequate return from the sale of the electricity which the apparatus consumed, which was the policy adopted by most gas undertakings. A number of electricity supply undertakings were operating assisted wiring schemes through contractors, to the great advantage of the undertakings; the contractors acted as unpaid canvassers, and when they secured new consumers or the installation of new apparatus in the premises of existing consumers, they carried out the necessary work at definite prices. It was better that consumers should be charged fixed sums for their installations, payable at intervals, if desired, rather than they should be charged so much per unit on the energy metered; the latter method tended to limit the use of electricity to lighting. The value of the provision of more plugs was also emphasised, and he pointed out that a system such as that adopted by one undertaking which, on introducing an assisted wiring scheme, had insisted upon the provision of at least two plugs, ought to be developed. A definite publicity and propaganda policy should also be decided upon, and a definite sum allocated: he suggested that this amount should be about 1 per cent. of the gross revenue, including the contribution to E.D.A. The latter contribution was only one-tenth of 1 per cent., so that nine-tenths of the total allocation could be used locally. Publicity should be superintended by an assistant who had specialised, and he urged that undertakings should make use of the E.D.A. posters, literature, window displays, &c. Special attention should be devoted to educational propaganda in schools, and efforts made to secure the permanent installation of apparatus in domestic science centres. As to the training of sales staffs, the E.D.A. had given recently a practical course in home

electrification for women in the industry, and this work could be developed if undertakings were willing to take advantage of it.

Mr. E. E. HOADLEY (borough electrical engineer, Maidstone), discussing some of the results achieved in his district, said he had not a special sales staff, but he had an efficient sales engineer (who had also other duties to attend to); every man employed in the department was a salesman, however, and had written instructions from time to time, and was paid for business secured. The policy of pushing out into country districts had been successful. With regard to hiring, he said that cookers, water-heaters, electric fires, and flat-irons were hired. One pattern of electric fire, in three sizes, was hired out, but other types could be obtained through contractors and arrangements made for easy payments. There was also one make of water-heater in three sizes, and it was going well. There was an attractive tariff for all-electric houses (houses with no coal fire), and there were 155 such houses in the district. The hiring rates included prompt maintenance service. The Maidstone Corporation had put up six electric houses as an experiment alongside six all-gas houses. Careful statistics taken over a period of twelve months had shown that, whilst the cost of gas houses was 3s. 9d. per week, the all-electric houses cost 3s. 9½d. There would be no gas mains on a new Corporation estate.

Mr. A. C. BOSTEL (County of London Electric Supply Co.), dealing with the sale of apparatus through showrooms, said that the public took advantage of apparatus which was demonstrated to them by efficient salesmen. The policy of linking up with the various manufacturers had proved itself, especially in the sale of vacuum cleaners, and he urged that the selling of electrical apparatus must be extended along those lines. He said that salesmen should be properly trained and adequately paid.

Mr. W. MILLNER (Westminster Electric Supply Corporation) said that his undertaking hired out cookers, heaters, irons, grillers, and vacuum cleaners. The scheme was based on the return of the capital within seven years, but there were few appliances in respect of which it took seven years to recover the capital expenditure, and in the case of irons it was nearer three years. The cost of maintenance of fires was almost negligible; it had worked out at less than 8d. per fire per annum over a series of years. The necessity for hiring would be less as time went on, having regard to the reductions in the cost of apparatus. An attractive tariff was offered for water heating, and they were selling water-heaters on hire-purchase terms. They did not exercise wiring powers, but referred consumers to electrical contractors where wiring was necessary. At the same time, they felt justified in selling apparatus which the consumers could themselves connect. He considered that the electrical industry was allowing the stores and other non-electrical concerns to secure a large proportion of domestic sales which were the legitimate right of the industry.

Mr. E. BROWN (Hackney Electricity Department) said that the assisted wiring scheme in Hackney was confined to small domestic premises, and ordinarily the number of points allowed was restricted to 8, but 10, and sometimes 12, were provided, on occasions. The average number of points per installation over the entire scheme was just over 5. In the six years ended March, 1928, some 1,200 installations were connected. In the first half of 1928 a three-part composite tariff was introduced as an alternative to the flat rate, and the scheme was pushed more vigorously. During the year ended March, 1929, nearly 1,000 installations were connected, and in the current corresponding year the number was 1,600. The undertaking had its own contracting department, and originally had carried out the wiring itself, but, since the work had increased considerably, for some time practically the whole of it had been sub-let to local contractors.

The CHAIRMAN urged that plain, simple tariffs should be arranged, without any humbug which frightened the consumer.

Lt.-Col. H. W. WATTS (Epsom) said that during the last three years his trouble had been to meet the demands upon the undertaking at Epsom. In the district there were 300 all-electric houses, the weekly cost of supply being from 3s. 6d. to 3s. 8d.

A number of speakers emphasised the necessity for efficient service. These speakers included Mr. W. HAINSWORTH (Croydon), who pointed out that, although cheap energy was important, efficient service was even of greater importance, because a supply undertaking had to live with apparatus from the time it was installed until the end of its useful life.

Another matter which was emphasised by subsequent speakers was the importance of simple tariffs.

International Television Association.

With the title of Institut International de Television, an association has lately been formed in Belgium with headquarters at 87, Chaussée de Tervueren, Brussels. The objects of the new body are to bring about co-operative action between television societies and persons interested in the science in different countries, to establish a centre for the co-ordination of information, and to organise conferences and demonstrations. It is intended to publish a journal devoted to television, which, in addition to its own special articles, will publish a summary of all books and articles on the subject appearing in other magazines throughout the world.

Parliamentary News.

[By our Special Parliamentary Reporter.]

Cardiff Corporation Bill.

The Cardiff Corporation on March 19th secured the approval of the House of Commons Select Committee on Local Legislation to a clause in an "omnibus" Bill, giving power to make by-laws against faulty electrical installations. The clause provides for by-laws "for the purpose of preventing fire or any injury to persons in any building or premises supplied by proposed to be supplied with electricity by the Corporation with respect to the nature, material, workmanship, and mode of arrangement of the wires, apparatus, and fittings in any such building or premises, and required to be used for the purpose of such supply, and may refuse to supply electricity or cut off and discontinue the supply of electricity to any building or premises in which such by-laws are not complied with."

Mr. C. G. MORLEY NEW, the City electrical engineer, stated in evidence that the regulations of the Electricity Commissioners merely permitted the Corporation to disconnect if leakage above a certain amount was found. Many cases had been found in which premises had passed the leakage test and yet contained installations dangerously faulty.

Two deaths had occurred in Cardiff as a result of electric shock due to faulty wiring of outbuildings of houses. The Coroner's jury had written to the Corporation urging that power should be obtained to prevent such fatalities. The Electricity Commissioners had found that their powers did not enable them to strengthen the Corporation's position in the matter.

Another clause in the Bill was to the effect that where a separate transformer is provided by the Corporation for a supply to any consumer the Corporation may use it for supplies to other consumers.

The clause was approved, as also were clauses giving power of entry where the Corporation has reason to believe that wrongful use of energy is being made; power to disconnect for default; and power to recover the costs of disconnecting.

Imperial Wireless Charges.

On March 18th, Sir HILTON YOUNG asked the Postmaster-General what was the estimated annual expenditure for the four Imperial wireless-telephone services which it was proposed to concentrate at Rugby and Baldock, including interest on capital, depreciation charges, running costs, overhead charges, and allowances for cost of research.

Mr. LEES-SMITH said that the total overall cost inclusive of land lines up to the point of connection with the London Trunk Exchange, of providing public telephone services with Canada, South Africa, India, and Australia, by means of the Post Office radio stations at Rugby and Baldock, was estimated at £43,000 a year. This cost included £4,000 a year for existing costs at Rugby and Baldock, making a net additional cost for the Dominion's services of £39,000 a year. It also included a margin of staff and equipment which would be available for the provision of other long-distance radio-telephone services. As the latter were developed, the annual cost of the four Imperial services would be reduced to about £36,000 a year.

Picture Telegraph Service.

On March 18th, Mr. LEES-SMITH informed Commander Bellairs that a picture telegraph service with Berlin was opened on January 7th and had since worked in a satisfactory manner.

Carmarthen and the Grid.

On March 19th, Mr. HOPKIN asked the Minister of Transport if it was proposed that the grid should be carried on to Carmarthen from Llanelly; and if any steps were now being taken to supply electrical energy to the rural parts of Carmarthen.

Mr. MORRISON said with regard to the first part of the question that he understood that representations on this matter had been made to the Central Electricity Board and would be discussed by the Board with the undertakers and others concerned shortly. With regard to the second part of the question, no application had been made for statutory powers to supply electricity in the unoccupied rural parts of Carmarthen.

London Electric Light Charges.

On March 24th, Mr. MUGGERIDGE asked the Minister of Transport if he was aware that the County of London Electric Light and Power Company, while charging 5d. per kWh for lighting within its Wandsworth area of supply and ¾d. per kWh under the all-in tariff system, charged consumers in the Romford area 6d. and 1d. per unit, respectively; and what steps he proposed to take to equalise charges throughout the greater Metropolitan area.

Mr. MORRISON said that the question as to the steps which could be taken to secure greater uniformity of charges and tariffs throughout the district of the London and Home Counties Joint Electricity Authority was being investigated by the Authority, but the latter was not at present in a position to make any report to the Electricity Commissioners on the matter.

Selected Radio-telephone Apparatus.

Brief descriptive details of useful devices and accessories available to broadcast listeners as aids to reception and better reproduction.

THE British Broadcasting Corporation's recent institution of simultaneous national and regional programmes, radiated from the Brookman's Park station, has been accompanied by the marketing of a variety of "wave traps" and selectivity devices with the avowed object of separating the dual transmissions from each other and permitting more distant stations to be received. Whilst some of them alleviate the interference of one station with another, their complete success is generally attributable to their being used in conjunction with a receiver of fairly good inherent selectivity itself, and few are of the requisite efficiency to do more than eliminate *one* of the dual-wave transmissions.

Filter Wave-traps.

The problem outlined above has been approached from a new angle by L. McMichael, Ltd., in that when designing the filter illustrated in fig. 1 the elimination of an unwanted

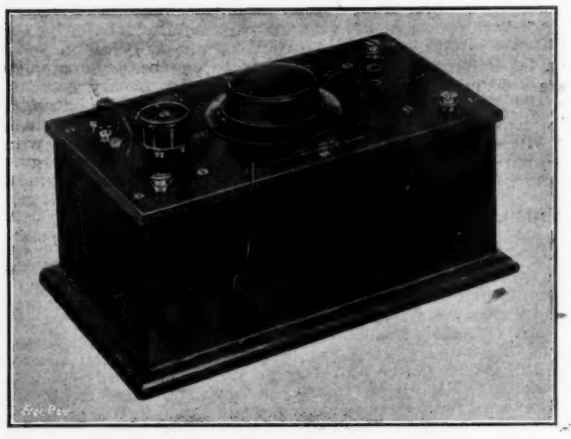


Fig. 1.—"M.H." Dual-wave Filter.

station was not attempted. Instead, the wanted station is given an easy, but very narrow, path into which any other station can only enter with considerable difficulty, if at all. It is claimed that the addition of the "M.H." filter to the most elementary receiving set will in practically any circumstances make possible completely independent reception of the dual 2LO (London) transmissions and 5GB (Daventry). Its use with more elaborate sets will enable distant stations to be heard, in addition to preventing one Brookman's Park programme interfering with the other. In the case of all but the most up-to-date sets it will improve selectivity and widen the useful reception range.

A more conventional type of wave-trap is purchasable from the Igranic Electric Co., Ltd. It consists simply of a tapped coil in parallel with a 0.0003-microfarad semi-variable condenser for connection in series between the aerial and receiver, it being both inexpensive and effective.

When considering selectivity allowance must be made for overall amplification, and it should be remembered that in the case of a mains-driven receiver reaction cannot be used as critically as in that of a battery-operated set because of mains input voltage variation. Accordingly the degree of selectivity obtainable without a serious sacrifice of quality is limited unless a wave-trap is used. Messrs. Ferranti, Ltd., have designed a high-class trap that is very sharply tuned and fitted with a switch so that it can be short-circuited when not required. It is to be available in several forms and, besides cutting out an unwanted station, is claimed to actually have the effect of increasing the signal strength of wanted stations operating on wave-lengths above that at which the trap is set.

A Radio-gramophone Adaptor.

An attractive component made by the Igranic Electric Co., Ltd., which should fill a long-felt want is an adaptor for connecting a gramophone "pick-up" to the l.f. amplifier and loud-speaker of a wireless set. The adaptor is plugged into the detector valve-holder and the valve replaced, a small knob enabling the user to switch over from radio to record reproduction, and *vice versa*, without dismantling or reconnecting any part of the set. In conjunction with a volume-control device, the adaptor enables any radio receiving set not specially arranged for the purpose to be easily adapted for the electrical reproduction of gramophone records, which is quite the best way of listening to them.

A Frame Aerial.

The "Goltone No-mast" aerial (patent No. 260089) is easy to fix, should be quite secure in gales, and aveids the use of a mast or pole. It is supplied by Messrs. Ward & Goldstone, Ltd., with 50 ft. of "Negrolac" down lead permanently fixed in the correct manner. It is made up in the form of a frame, or plate, which is screwed to a cross-piece after the latter has been nailed flat to the exterior wall of the house, as high up as possible.

Loud-speakers.

We have received a sample universal double-cone speaker chassis from the Shaftesbury Radio Co., being a well-made smaller pattern of the Wates "Star." Unlike the latter, however, and as its name suggests, it is provided with a bracket designed to accommodate almost any one of the available makes of driving unit; screws, nuts, washers, and an extension piece are provided to facilitate fixing. The two cones are made of a special paper doped with oil to retard deterioration and maintain constancy of performance. The larger cone has a diameter of 11½ in., and responds to the lower frequencies; the smaller cone, which is 5 in. in diameter, vibrates to the upper register and, in conjunction with the large cone, is intended to ensure even reproduction over all frequencies without over-emphasis of any range. Another important point is that the chassis will fit the majority of existing cabinets; thus one can convert an old-fashioned loud-speaker into a modern reproducer.

Loud-speakers are now available that are so arranged that their impedance can be adjusted with facility to suit the output circuit of the receiving set in conjunction with which they are operated. Such useful provision is made in the case of the type "K" instrument of the Mullard Wireless Service Company, Ltd. It consists of a balanced-armature movement driving a 13-in. diameter cone, the whole being mounted in a polished oak cabinet, fig. 2, 19 in. square. By means of sockets at the back of the instrument either one-third, two-thirds, or the whole of the speech coil can be utilised, so

Fig. 2.—Mullard Speaker.

that its impedance can be adjusted. The front fret has been designed to present the minimum obstruction to the sound waves, and the back is also open, so that reproduction is not impaired by the presence of the cabinet. The movement is protected against dust by silk screens at the back and front.

Messrs. Philips Radio, Ltd., are also marketing a cabinet cone speaker which incorporates a balanced-armature and a three-way impedance switch in the input leads. Type 2019 has a moulded bakelite case with a metal grille.

Photo-cells and Relays.

Some Notes on the "Carola" Photo-electric Cells and Vacuum Relays of Messrs. Isenthal & Co., Ltd.

THERE are two usual types of photo-electric cell, one possessing a high vacuum, and the other filled with one of the rare gases. Depending upon the application of the cells, there is a further difference in the material of the bulb; this may either be ordinary glass, transmitting all visible light rays; "Uviol" glass, transmitting the shorter waves; or quartz,

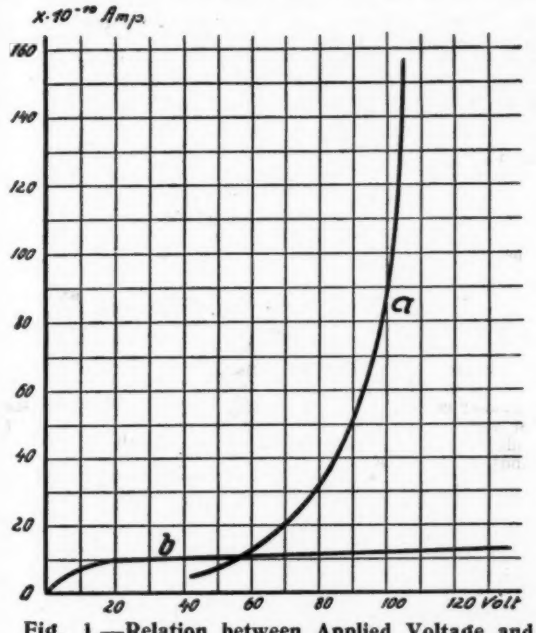
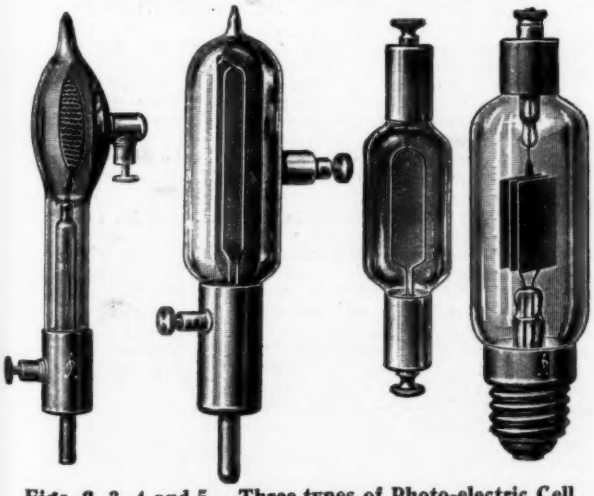


Fig. 1.—Relation between Applied Voltage and Sensitivity.

transmitting the ultra-violet range of the spectrum. Cells also differ with regard to the material used for the cathode, which may consist of potassium, potassium-cæsium, potassium rubidium or sodium. Rubidium displaces the maximum of sensitivity in the spectrum from the blue towards the green; this has an advantage when the cell is used with incandescent lamps, but it adds to the cost of the cell and adversely affects the constancy. All these metallic deposits, which are of extreme



Figs. 2, 3, 4 and 5.—Three types of Photo-electric Cell, and a Glow Relay.

purity, are subsequently hydrated, so as to increase the sensitivity. The chief difference between the gas-filled and the vacuum type of photo-cell consists in the greater current obtainable in the former for a given light intensity, which does not necessitate so great a subsequent magnification of the photo-electric currents. Where extreme constancy is the main object, however, the vacuum cell is preferable, especially since (within practical limits) its emission is independent of the working voltage. The sensitivity of the gas-filled type increases with the applied potential, and reaches the maximum just before the glow potential is attained (at about 130 volts). The cells must therefore be protected by means of a very high series resistance, against glow discharges due to voltage fluctuations. Curve *a* in fig. 1 shows the relation between applied voltage and sensitivity in the gas-filled cell. The vacuum cell differs in so far as its sensitivity reaches practically maximum at 50 volts (curve *b*).

There are three essential constructions of the cells. In the grid type of cell illustrated in fig. 2 the cathode is practically flat (for accurate distance methods) and the anode is in the form of a gauze covered ring (grid).

The type depicted in fig. 3 is of circular cross section and is very sensitive, whereas that shown in fig. 4, while similar in appearance, has a flat cathode; the anode is anchored at both ends, and the terminal caps are arranged at both ends of the bulb. By using two such cells, side by side with a space left between, it is possible to employ the cell for reflected light (as in the case of the "ring" type of cell successfully used by Telefunken and others for picture transmission).

The glow relay, fig. 5, is a highly sensitive discharge relay for laboratory and industrial purposes. Its special advantages are: minimum of primary current; large secondary current; energy consumption nil when working below critical voltage; freedom from inertia; absence of mechanical parts; insensitive to vibrations; and moderate first cost. It operates definitely with an impulse current of only 10^{-10} A, and when discharging passes as much as 30 to 40 milliamperes, so that the amplification obtained when using a mechanical relay for 1 A in conjunction with it amounts to 10 milliards. In combination with highly sensitive photo-electric cells the glow relay will operate

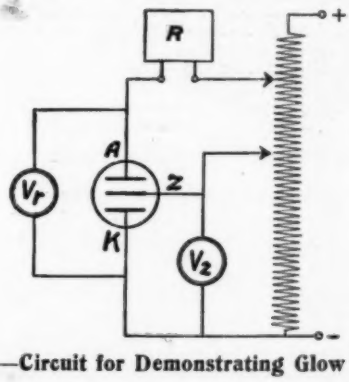


Fig. 6.—Circuit for Demonstrating Glow Relay.

on minute variations of light intensity. It is generally possible, where actual movements have to be recorded, to do so by directing a ray of light by means of mirrors and diaphragms on a photo-electric cell, which in turn will influence the glow relay. The connection to high-tension transmission lines of discharge tubes or glow lamps will furnish a means of controlling from a distance—*via* photo cells and glow relays—the necessary switchgear. Since the glow relay comes into operation at a definite voltage (about 200) it may also be used for recording voltage or current variations; another field for the use of the glow relay, as it is free from inertia, is the recording of time signals.

Fig. 6 shows the usual circuit for demonstrating the apparatus; both the relay voltage vr and the control voltage of the electrode z may be varied. When electrode z is disconnected and relay voltage vr is gradually increased, a value is reached when the glow discharge suddenly sets in. In practice the voltage vr is kept at about 5 to 20 volts below this "threshold" voltage, during which period an increase of the control voltage vz to the "spill-over" voltage will bring about the glow discharge between the outer electrodes. The value of the spill-over pressure is usually in the neighbourhood of 180 volts. In the "expectant" stage, both the relay voltage and the control voltage are maintained below the critical value, and the discharge is released merely by raising the control voltage above the critical value. It is therefore necessary so to connect the glow relay that the current to be demonstrated *increases* the voltage at the control electrode. The intensity of the resulting relay current (from 20 to 40 mA) is sufficient to work an ordinary mechanical relay R, but *since after the spilling-over the glow discharge does not spon-*

taneously discontinue, the mechanical relay R should be so designed that it automatically opens the discharge circuit.

Fig. 7 shows the relay in combination with a photo-electric cell; illumination of this cell will result in the charging up of condenser C until the potential of the middle electrode Z has reached the trigger or (spill-over) voltage. At this moment the mechanical relay U operates a signal, and also interrupts the circuit through A and K. The resistance in the photo-cell circuit is adjusted sufficiently high for this trigger circuit to interrupt automatically. It is obvious that when the capacity of the condenser C increases, or when the intensity of illumination is reduced, the discharge takes place at longer time intervals; this discharge frequency is proportional to the light intensity, and if a counter is arranged with relay U it is possible to register the illumination directly. Similarly all kinds of ionisation phenomena may be recorded, and a great many technical—and laboratory—applications can be evolved.

Whilst the photo-electric cell is the ideal and only means of converting light variations into electric impulses for transmission, there are one or two ways of re-converting electric impulses into variations of light intensity, and the most sensitive method is by way of the "Kerr" cell, which consists esentially of a suitable transparent vessel (B) within which two flat disks or electrodes are mounted, so that their distance apart may be delicately adjusted from the outside by means of a large milled disk D.

These electrodes are connected in a circuit, so that the electrostatic field between them can be varied or influenced by electric impulses transmitted by wire direct, or by electro-magnetic waves. The cell is filled with nitro-benzole and

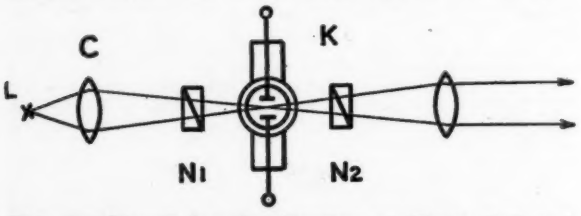


Fig. 7.—Circuit for Combination of Photo Cell and Glow Relay.

arranged in an optical system somewhat as shown in fig. 8, where L is a source of light which after collimation by a lens C passes through a crossed nichol prism N, then through the electrode space, continuing through a second nichol N_2 and lens on to the rotating slotted disk of a television receiver. According to the varying potential impressed upon the "Kerr" cell, the plane of polarisation of the beam of light will be rotated, thereby varying the intensity of the emergent light.

Electric Cast-iron Melting.

The reduction of iron ore in the blast furnace results in a metal not over 92 to 96 per cent. pure and badly contaminated with carbon, silicon, manganese, sulphur, and phosphorus. The competition of cast, stamped, plate and welded steel, and the general tendency toward the more efficient use of all materials, has forced the grey-iron foundry to consider improvements in the quality of average cast-iron. The electric furnace is proving useful in this direction, and according to the *Electrical World* tensile strength has been increased by its means to a maximum of 64,000 lb. Conspicuous improvement has also been achieved in the refinement of grain structure. The electric furnace facilitates the use of alloys, especially in the production of more complex irons, such as non-magnetic and high silicon irons. Recently the largest producer of high-silicon iron for chemically resistant ware started up an electric furnace for its manufacture, displacing two air furnaces. With certain complicated patterns the fuel-fired furnace product gave serious shrinkage trouble, so that four out of every five castings had to be scrapped. On the first test with the electric iron five out of five of the castings were usable, and the actual scrap castings have been reduced by more than 50 per cent. since the electric-furnace process was installed. One of the most important contributions of the electric furnace to grey-iron metallurgy is the ability to superheat the metal to any desired degree under absolute temperature control.

It is stated that an energy consumption of 450 kWh per ton is a reasonable figure for an electric cast-iron melting furnace while running, rising to 550 kWh per ton in intermittent or partial service. In a typical case the roof-lining life was 635 tons, and the side walls were not replaced until 875 tons were poured. Several steel foundries are making cast-iron in electric furnaces. In one case a spare 10,000-kW generator is used to supply electricity at 0.125d. per kWh.

Figures are given of the cost of working an 8-ton electric furnace with a charge made up of: 1,000 lb. stove plate at $12 per ton, 10,800 lb. borings at $10 per ton, 3,000 lb. foundry returns, 1,200 lb. steel scrap. The cost of the metal charged is $11.97. The cost per ton of metal in the ladle is: Scrap metal, $11.97; Alloys, $1.27; Electric energy, $4.66; Electrodes, $2.18; Refractories, $0.60; Water, $0.11; Labour, including melter and helper, $1.08; Melting loss, $1.13; Interest on investment, $0.57. Total cost of iron in the ladle, $23.57.

Baking Ovens.

Comparative data for electricity and other fuels, and various types of ovens used for the baking of bread and confectionery.

By W. ELLERD STYLES, M.I.E.E.

(Abstract of a lecture given in a specialist course on "Modern Bakery Practice" at the Borough Polytechnic Institute.)

THERE are three methods of constructing electric ovens: steel casing, with the baking chamber efficiently insulated against heat losses; steel casing, with an inner lining of firebrick outside of which is located an efficient heat insulator; and solid brick ovens having entire insulated brick surrounds, and the oven front faced with glazed bricks or tiles. The last-mentioned type of oven would be greatly in demand should night baking be abolished, because they are of the thermal-storage type, and can be automatically controlled and ready for baking at the required time.

From an address, presumed to be by an expert, it is desirable to extract some of the data, as quoted by the *Baker and Confectioner*; one shillingworth of coal at 42s. per ton has a calorific value of 746,000 B.th.u.'s; one shillingworth of oil at 70s. per ton has a calorific value of 592,000 B.th.u.'s; and one shillingworth of electricity at 0.75d. per kWh has a calorific value of 55,400 B.th.u.'s.

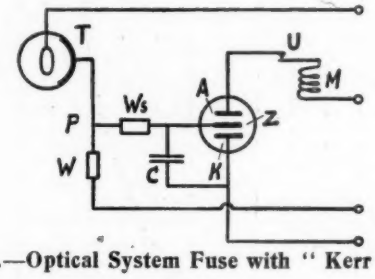


Fig. 8.—Optical System Fuse with "Kerr" Cell.

The calorific value of fuel is as follows: Coal, 12,000 to 14,000 B.th.u. per lb.; fuel oil, 18,000 to 19,000 B.th.u. per lb.; and electricity, 3,415 B.th.u. per kWh. The change of efficiency of a furnace due to its erroneous loading is approximately:—

Loading	¼	½	¾	Normal	5/4
% efficiency	35	60	72	81	75

Reverting to the report in the *Baker & Confectioner*, the costs of B.th.u. for the respective fuels are values for tests under conditions of perfect combustion.

What actually counts is the percentage cost per 2-lb. loaf of bread baked. The efficiency of [illegible] comparison with electricity actually gives the following results: Coal at 13,000 B.th.u. at 15.6 per cent. efficiency, 1s. purchases 109,200 B.th.u.; oil at 18,500 B.th.u. at 16.5 per cent. efficiency, 1s. purchases 97,600 B.th.u.; electricity at 3,415 B.th.u at 87 per cent. efficiency, 1s. purchases at 0.5d. per kWh 71,300 B.th.u. and at 0.75d. per kWh 47,500 B.th.u.

Proceeding further we find that, based on the above efficiency, the theoretical requirement to bake a 2-lb. loaf is 397 B.th.u.; the practical average with electricity is 460 B.th.u.; the practical average with oil is 2,840 B.th.u.; and the practical average with coal or coke is 3,000 B.th.u. The resultant of these figures is that with coal 1s. will bake 248 2-lb. loaves; with oil 1s. will bake 208 2-lb. loaves; and with electricity at ½d. per kWh 1s. will bake 155 2-lb. loaves.

In order to allow for fuel-handling and storage costs, it is necessary to add 7d. to every 1s. for coal, and 4d. to every 1s. for oil.

The final comparison then becomes: with oil, 1s. will bake 156 2-lb. loaves; with coal, 1s. will bake 156 2-lb. loaves; with electricity at 0.5d. per kWh, 1s. will bake 155 2-lb. loaves.

Allowing that 280 lb. of flour made into dough produces 186 2-lb. loaves, the final result with oil, coal, and electricity at 0.5d. per kWh is approximately 1s. 2d. per sack in each instance. It now becomes apparent that electric ovens are as economical as fuel-fired ovens. We have, however, to consider another very important factor with electric baking. On the authority of several very prominent bakers it has been found that with electricity the dough can be scaled off at 2 lb. 3 oz., instead of the usual 2 lb. 4 oz. necessary with fuel-fired ovens, and the baked loaves will all be full weight after cooling. With bread at as low as 4d. per 2-lb. loaf, this is a saving of 20d. on 280 lb. sackage. As the cost of electricity per sack equals 14.0d., there is an actual recovery of about 6d. on each sack baked. Assuming a weekly sackage of a nominal 25 sacks per week, this would mean a saving of approximately 12s. 6d. per week.

The cost of an oven capable of dealing with the above sackage may be taken as £340. Depreciation can be fixed at 10 per cent., so that at the end of the first year we write off £34. The annual saving on scaling for 25 sacks weekly is

52 × 12s. 6d., or a total of £32 10s. We therefore have an annual fuel cost of 30s. after the first year's use of an electric oven, having written off £34 for annual depreciation. These figures are based on a rate of .5d. per kWh.

Tests on an 8 ft. by 4 ft. two-deck oven for a 135-hour working week indicate a total of 1,540 kWh. The maximum loading of the oven is 25 kW. The actual load on an oven is shown to be 46 per cent. of the maximum, or 11.5 kWh per hour; at 0.5d. per kWh the cost totals 5.75d. hourly. Even at full load not more than 25 kWh could be used hourly on this oven which would total 12.5d. at .5d. per kWh, assuming 1 hour per batch. For a mixed trade the figures are proved to be still further improved. It is important to note that pre-heating of the oven has been allowed for when arriving at the totals. Further proof of the efficiency of electric ovens is found in the following data concerning three existing ovens: No. 1, 8 ft. by 4 ft., two-deck, bread, morning goods, and confectionery baked; No. 2, 8 ft. by 5 ft., two-deck, only morning goods and confectionery baked; No. 3, 8 ft. by 5 ft. two-deck, bread, pies, and confectionery baked. The relative costs for electricity are: No. 1 at 0.6d. per kWh, 1.8 per cent. of the value of the goods baked=4.5d. per £1; No. 2 at 0.75d. per kWh, 1.4 per cent. of the value of the goods baked=3.5d. per £1; No. 3 at 0.5d. per kWh, 1.0 per cent. of the value of the goods baked=2.4d. per £1.

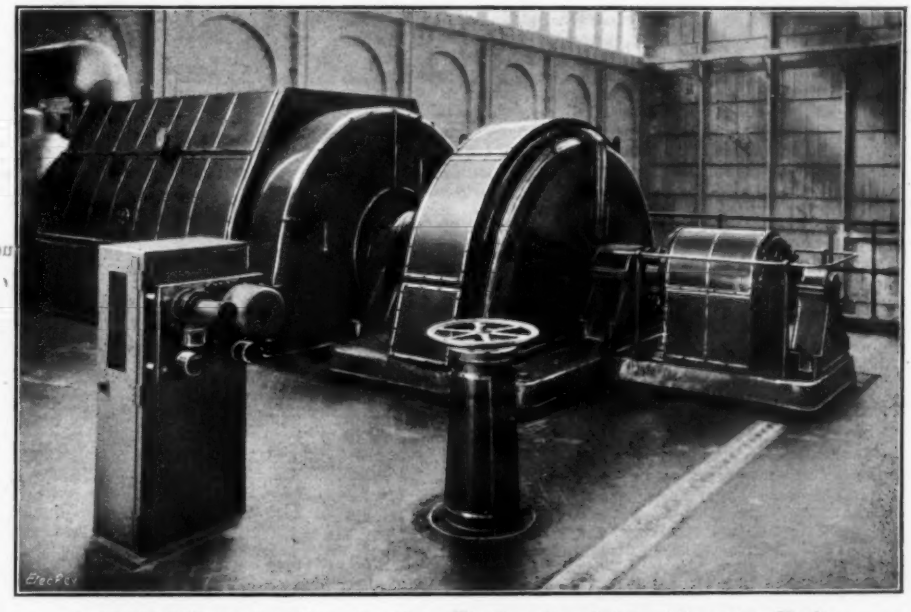
Other advantages of electric ovens are: they occupy one-third less floor space than fuel-fired ovens; their extreme cleanliness; absence of fumes; no odours; independent control of oven temperature; baking temperature reached rapidly; perfectly uniform baking; continuous baking; flexibility; exterior of ovens relatively cool at all times; and no fuel handling or risk of explosion.

Turbo-generator Equipment.

Notes on recent technical developments in connection with important orders received by the British Thomson-Houston Co., Ltd.

THE Kearsley power station of the Lancashire Electric Power Co. has been started up, and the two 32,000-kW continuous maximum-rated turbo-alternator sets have been put into commission. It is expected that the excellent results obtained at the Padiham power station of the L.E.P. Co. will be surpassed at Kearsley, and it is interesting to refer to the fact that Padiham, with a fuel consumption of 1.33 lb. of coal per kWh generated and a thermal efficiency of 21.35 per cent., ranks as the most efficient power station in Great Britain, irrespective of size and output (see ELECTRICAL REVIEW, November 22nd, 1929, p. 912). The steam conditions at Kearsley are 300 lb. per sq. in. gauge, 250 deg. F. super-heat and 29 in. vacuum.

Reference should be made to the electrical ends of two 25,000-kW, 3,000-r.p.m. turbo-alternators, which were put into commission during 1929, as interesting features are incorporated by the provision of a ventilating fan driven in tandem from the main alternator shaft in each case. These fans can be more efficiently designed than those mounted on the ends of the rotors of such high-speed machines, and the arrangement appeals to many operating engineers as preferable to that in which the ventilation is effected by means of separately-driven fans mounted on the foundations. The accompanying illustration shows one of the turbo-alternators. The stator frame is fabricated and is provided with thermometers for measuring the temperature of the inlet and outlet air. The thermometer for the outlet air is used also to operate the air-cooler alarms, should the outlet air reach a certain predetermined maximum temperature. The separate fan is shown coupled to the alternator, to which is also coupled a stabilised exciter consisting of a main exciter and a service exciter. In the foreground of the illustration is a cubicle containing the field-suppression gear, upon which is mounted the air cooler alarm. The pillar in the foreground is for the emergency operation of the dampers in the air ventilation circuit.



A 25,000-kW Turbo-alternator Set with Fan Coupled to Alternator Shaft.

A 30,000-kW three-cylinder turbo-alternator is under construction in the Rugby factory. The turbine is designed for use with steam at 1,200 lb. per sq. in. gauge, superheated to a total temperature of 725 deg. F. The steam is expanded in the high-pressure cylinder down to 200 lb. per sq. in. gauge, and is re-heated at this pressure to a total temperature of 550 deg. F. A considerable quantity of the steam at 200 lb. per sq. in. gauge is exhausted for process work. This set will operate at a speed of 3,000 r.p.m., the turbine being of the impulse type throughout and exhausting into a vacuum of 29 in.

A 10,000-kW, 3,600-r.p.m. turbo-alternator, the turbine of which is designed for initial steam conditions of 365 lb. per sq. in. gauge, and a total temperature of 1,000 deg. F., the vacuum being 29 in., is now approaching completion. The turbine is of the two-cylinder type, the extra-high-temperature portion being confined to one cylinder. Three-point extraction is provided for giving a final feed-water temperature from the last heater of 312 deg. F. at 8,000 kW load.

The manufacture of the 67,200-kW turbo-alternator set for the Battersea power station of the London Power Co. is proceeding. The turbine is of the three-cylinder type and will run at 1,500 r.p.m. with steam conditions of 570 lb. per sq. in. gauge, 850 deg. F. total temperature, and 29.1 in. vacuum. Another large turbo-alternator in process of manufacture is a 50,000-kW maximum-rated set for the Ironbridge power station of the West Midland Joint Electricity Authority. This turbine will operate with steam at 375 lb. per sq. in. gauge, 750 deg. F. total temperature, and when dealing with 50,000-kW load it will exhaust into a vacuum of 28.9 in.

Other interesting orders in hand include one from the Anglo-Persian Oil Co. for two 1,500-b.h.p. maximum-rated turbines running at 6,550 r.p.m. and driving high-pressure multi-stage oil pumps through reduction gearing, the speed of the pumps being 1,200 r.p.m. In these sets each turbine is mounted direct on its condensing plant, which also forms a foundation not only for the turbine but also for the reduction gearing. The base-plate carrying the turbine oil pump and the circulating pump for the condenser is bolted direct to the condenser, and the extraction pump for the condensate is driven by the turbine through worm gearing. The air-extraction is steam operated. A complete combined unit of this type is very compact, requires no costly foundations, and takes up a minimum of floor space, while installation costs are reduced and savings shown on operating charges.

For the Mersey Paper Mills of Messrs. Bowater's, Ltd., a 6,000-kW maximum-rated extraction turbo-alternator set is being manufactured. The steam conditions are 300 lb. per sq. in. gauge, 650 deg. F. total temperature, and 28 in. vacuum; the turbine will be capable of passing out 100,000 lb. of steam per hour to the heating main at a pressure of 10 lb. per sq. in. gauge. During the past year designs have been laid out for a 50,000-kW, 3,000-r.p.m. turbine, the design being such, it is claimed, that even at this rating no more difficult problems as regards stresses in the rotating disks have to be faced than is the case with machines of much smaller capacity.

Electrical Medical Apparatus.

An account of the manner in which applied electricity not only assists, but actually leads, medical and surgical research towards the cure and alleviation of the consequences of specific diseases, and a review of the diagnostic and therapeutic applications of radiology.

By B. LEGGETT, M.R.C.S., L.R.C.P., A.M.I.E.E.

(*Extracts from a paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

MEDICAL electricity can benefit greatly by treatment from a purely electrical aspect, particularly in relation to terminology. Only in recent years has any attempt been made to rationalise X-ray apparatus according to electrical engineering standards, and so help to remove much of the obscurity which, in medical work, has grown around such apparatus, where the utmost confusion reigned, and still often reigns. The whole scope of radiology is permeated by differences of opinion, nearly all of which are at once explainable if we abandon opinions and consider what our instruments are reading in relation to the current and voltage wave-form and form factor.

The great value of this branch of electricity is not recognised by any means to the extent it warrants in this country. When it is considered that the combined services of the pathologist and radiologist are responsible for perhaps 95 per cent. of all positive diagnoses, it is surprising that on most hospital staffs these two specialists are not considered sufficiently important to have seats on the hospital medical committee. This is a purely insular conception, and abroad, particularly in the United States and Germany, this condition of affairs does not appertain to a similar extent, radiologists being often considered sufficiently important to be chairmen of such committees.

Great Britain is very poorly served in respect of radiological literature, although the single journal is, the author believes, the first specialised journal relating to radiology.

Similarly, whilst we have large radiological departments in hospitals at Edinburgh and Manchester, they are relatively very small, when compared with the equipment of hospitals in Leipzig, Frankfurt, Leningrad, and many places in the United States, where the role played by electro-medicine is much greater than in this country.

The applications of electricity in medicine may be classified as follows:—

(1) X-radiation, for the diagnosis of disease and the treatment of certain specific diseases.
(2) Radiations emitted by radium (and thorium), for the cure of specific diseases, often applied in conjunction with X-rays.
(3) Ultra-violet radiation, to cure certain specific diseases and to aid the diagnosis of certain skin diseases.
(4) High-frequency energy, to produce a moderate degree of heat in the body for curative purposes, or a greater degree of heat to cause coagulation and destruction of tissues, which, when applied to a localised area, can sever tissues without promotion of hæmorrhage, as in the case of the surgical scalpel.
(5) Static electricity, for the purpose of stimulating tissue function.
(6) Direct and alternating currents of low frequency for the stimulation of muscle and nerve.
(7) The sensitive string galvanometer, to determine the electrical variations which occur in muscle tissue, particularly in the case of the heart muscle, when the instrument is termed an electro-cardiograph.
(8) Illumination, to light operating tables without the production of shadows, and so to aid surgical manipulation; small electric lamps to illuminate and allow vision of the internal cavities of the body, such as the respiratory and food passages and the bladder, to enable one to search for the presence of foreign bodies and growths.

Of these applications the most important, to the author's mind, are those of X-rays. The use of ultra-violet light, however, is a very extensive one; whilst it is an effective therapeutic measure for the cure of certain diseases of nutrition and of the skin, it has suffered in the past from undue advertisement and has even been advised for such conditions as cancer, which has tended to bring it into undeserved disrepute. At present there is much interest concerning the application of the electrical radiations of radium; its use is somewhat restricted, perhaps advantageously, since for good results a knowledge of radiation physics is far more essential than surgical knowledge and, as such knowledge is practically restricted to those who have experience of X-ray therapy, the general application of this agent without such basic knowledge can only bring it into disrepute. It is not sufficiently recognised that X-rays are akin to radium "gamma" radiation, and that, in addition, with X-rays we have control of the intensity and wave-length of the radiation. Competent observers abroad, who have used both radium and X-rays, have reported in favour of X-rays, but this is not sufficiently appreciated in this country where, at the moment, there is a persistent demand for more and more radium.

The electro-cardiograph illustrates how medicine and surgery can benefit by the collaboration of the non-medical investigator. Muscle contraction is accompanied by certain electrical changes which have, as their basis, physiological changes, which in turn are fundamentally chemico-physical changes. These electrical changes are recorded against time as the abscissa, and these curves are of the greatest diagnostic value. Van der Pol and Van der Mark have considered the electrical changes of the heart by the analytical method, in which the anatomical characteristics are represented by electrical circuits having certain electrical characteristics. From these considerations they built up an electrical model of the heart and from it obtained "artificial electro-cardiographs," which not only represent all the morbid conditions of the heart known in medicine, but also show further abnormalities which can be obtained with the model, the occurrence of which in the actual heart are nearly certain, although they have not yet been discovered in actual clinical work.

X-Ray Tubes.—Classification is according to the method by which electrons are produced for the passage of current, namely:—

(1) By the ionisation of the residual gas.
(2) By the emission of electrons from a heated filament.
(3) By the extraction of electrons from the actual metallic electrodes by the application of concentrated electrostatic fields.

There is an alternative classification, according to whether the tube envelope is constructed purely of glass or of glass and metal.

The manufacture of gas X-ray tubes is a declining industry. The gas tube is, however, by no means quite extinct, and in the hands of skilled radiologists and radiographers it can give results quite equal to the modern electron tube. For superficial therapy, *i.e.*, the treatment of skin lesions, there is still much to be said for this type of tube from the economical aspect; whilst the author uses for his radiographic work a metal-protected tube, dependent upon electron emission from a heated filament and costing £40, for his skin treatments he uses a gas tube costing about £8. When the exposures vary in time from 0.1 to 3 sec. the life of the electron tube is very long. When, however, one is giving therapeutical treatment a single treatment may last for 20 or 30 minutes, and (with a filament life of 1,000 hours) only about 3,000 treatments are possible. The use of the gas tube is therefore more economical, always supposing the operator to have sufficient skill to use it with negligible variation over such a period, an operation by no means easy. After due consideration the only virtue of which the author is aware is the economical one given above. If he could purchase metal-protected electron tubes at a cost equal to that of the gas tube he would no longer use gas tubes, as the more easily-regulated electron tube is, within reason, always ready for sudden calls. Now that the patent rights of the electron tube are about to expire and their manufacture is becoming more general we hear much less than hitherto about the supposed advantages of gas tubes. The tube industry, however, is now suffering from the fact that the life of the electron tube is so lengthy that (now that the immediate supply has been satisfied) new demands are so small that large tube-manufacturers find the renewal demand insufficient to support their large staffs. As a result they have been compelled to try to popularise radiology. If there were sufficient skilled radiologists this would be a decided advantage both to radiologists and to the community at large. Radiology is, however, such a very specialised branch of medicine that, without extensive experience, X-ray findings may be actually more dangerous than if a case is treated without the aid of radiology on purely clinical findings.

The majority of present-day radiographic work can be carried out with tube currents not greater than 50 mA. With such a current a radiograph of the thorax can be obtained as quickly as it is possible to make and break a manual switch, perhaps about 0.1 sec., about the limit at which the usual

automatic switch will operate with any degree of accuracy. Tubes are, however, manufactured to give 1,000 mA for short periods for radiography of the heart at a long distance to avoid distortion, X-ray kinematography, and to curtail the time of treatment. Except for these special purposes, such tubes appear to have no great sphere of application, as already in abdominal work many radiologists prefer to increase the time of exposure in order to bring into action accessory apparatus (Potter-Buckey grid).

The greatest need at present is for tubes which will operate at pressure above 250 kV. At 1,000 kV we should obtain radiation analogous to the gamma radiation of radium, which would allow important therapeutical extensions, particularly since there is some reason to believe that the most advantageous radiation for cancer treatment actually lies above that of present-day high-voltage X-rays, but well below that of radium gamma radiation, and we are unable to modify the latter.

At present tube manufacture lags behind high-potential generation, due to the difficulty of maintaining the tube vacuum, which necessitates difficult metal to glass joints. Is it not possible to dispense with such a vacuum and therefore to obviate these joints? With normal voltages in air, owing to the impacts the electrons experience with the gas atoms, the electronic energy is frittered away and the velocities necessary to produce X-rays are never reached. The author has attempted to produce X-rays at atmospheric pressure at the common voltages and has produced shadows on films. The method used depended upon the prevention of ionisation, and is, the author believes, capable of practical application. Apart from this method, he is of opinion that it is quite possible that when a discharge from a transformer of 1,000 kV, or more, occurs in air some of the electrons in the gas may obtain sufficient velocities to excite X-rays. Possibly those engaged in e.h.p. research may be unknowingly exposed to X-rays. For therapeutical purposes it may be possible with very high voltages to dispense with a vacuum, or to use a relatively low vacuum to excite X-rays in an enclosure having apertures through which the radiation passes. Such protective insulation would be expensive, and the objection of the noise of discharge and many other difficulties would have to be overcome, but, with the rarity and high price of radium, such an installation might be economically advantageous.

Protection.—In the future, as is already the case in Russia and other countries, X-ray apparatus will become amenable to the Factory Acts, and a minimum space and other suitable accommodation will be required before permission is given to install apparatus actuated at a high potential. At present in this country anybody without the slightest knowledge of electricity can install X-ray apparatus. Accidents are invariably due to operation by unskilled persons, *e.g.*, by non-trained resident doctors or nurses in the absence of the radiologist or the radiographer.

The author suggests that a Committee of the Institution should be appointed to assist in laying down a set of rules concerning X-ray apparatus, which is electrical apparatus and therefore within its province. The present recommendations are unsatisfactory to many persons, as they give no indication how the radiologist can himself test his apparatus and ensure that it is safe both electrically and physically. At present each piece of apparatus has to be sent for separate test and an expensive certificate obtained. The recent British Standard Specification for X-ray transformers is a step in the right direction, but the subject could be much extended.

Standardisation.—One can commiserate with the unfortunate manufacturer who, instead of being able to standardise his apparatus with resultant economy of manufacture and cost, has to modify nearly every apparatus for the particular purchaser. The British Engineering Standards Association would do much good if it would extend its specifications to the usual components of an X-ray department. Much of this apparatus is purchased, for example, for municipalities and installations abroad, by those who have no specialised knowledge. As a result many auxiliary appliances are bought which, when the apparatus comes into use, are discarded by a practical user. It does not appear to be impossible to lay down standards regarding the general requirements of such apparatus; they would be of great advantage to the non-technical purchaser, and should also comprise detailed requirements as to protection.

Artificial Sunshine.—After the applications of X-rays to purposes of diagnosis and therapy perhaps the next most important branch of electro-medicine as regards usefulness and rational application is the application of that part of the electromagnetic spectrum we term the ultra-violet. The three chief methods of producing ultra-violet radiation for medical purposes are:—

(1) Ordinary carbon-arc lamps with carbons either cored or impregnated with various metals, or metallic salts, as this has a great influence upon the relative distribution of the spectral energy. There is nowadays a tendency to revert to the carbon-arc method of generation, and competent observers have reported in favour of this type of lamp, the underlying reason doubtless being that the spectral distribution is more analogous than any other to natural sunlight.

(2) The mercury-vapour arc. The radiation has a much larger relative ultra-violet component and the spectral distribution extends more into the ultra-violet region, but it is not so analogous to sunlight and gives a more discontinuous spectrum. The lamp is much more convenient, but its past popularity has probably been largely the result of intensive commercial propaganda.

(3) The tungsten arc. This has a still deeper relative spectral distribution with respect to the ultra-violet region, and finds application in the treatment of localised diseases, such as lupus and other skin conditions. Actual spectral comparison shows that electrodes of nickel or iron give a better spectral distribution than the more expensive tungsten.

The dosage in ultra-violet radiation can be measured by a number of methods, none of which is entirely satisfactory, and many are analogous to methods used in X-ray therapy.

During the past few years there has been a great boom in artificial sunlight treatment. This is now definitely subsiding and this method of treatment is now settling down to reasonable proportions.

In spite of undue claims, this method of physical therapy is of definite importance. Its greatest value has been in conditions of bone disease, such as rickets in children and osteomalacia in adults, diseases which are due to errors of metabolism resulting in deficient deposition of calcium in the bones. As cod-liver oil, given over an extended time, is somewhat expensive, it is much cheaper to submit children to ultra-violet radiation, a procedure which invariably results in cure in a few months, as may be proved by radiographs of the bones. This has been the most important rational application of ultra-violet energy, but of recent years a severe blow has been dealt to it by the discovery that the actual cure is due to the light producing in the patient's skin, by photo-chemical means, of a body known as ergosterol, and as regards rickets a similar effect can be produced by exposure of the food instead of the patient. Hence many have given up ultra-violet treatment in favour of the prescription of irradiated sterols, and it is now an open question which mode of treatment will eventually find favour.

The author believes that ultra-violet energy could be utilised in surgery to a far greater extent than it is at present. In the case of fractures union results by the ultimate deposition of calcium salts, to which the bone owes its mechanical strength. Experiments abroad have shown that, in the case of artificially produced fractures in animals, reunion occurs much more rapidly if the animals are submitted to artificial sunlight.

Diathermy.—A rational use of electricity in medicine is that of the employment of high-frequency currents to heat the tissues of the body to any desired degree, ranging from the production of a gentle beneficial heat to an intensity which causes the necrosis or death of tissues.

In medical diathermy the object is to produce slight beneficial heat, whereas in surgical diathermy the object is to produce such a degree of heat that the tissues are coagulated and destroyed, by the use of one large and one pointed electrode, so that at the point electrode the energy is concentrated over a small area. Usually surgical diathermy apparatus is operated at higher frequencies.

The effects of high-frequency energy upon tissue vary according to whether we have damped oscillations, as given by a spark-gap method of excitation, or continuous oscillations, as given by valve excitation. With damped waves there is a greater degree of immediate coagulation of surrounding tissues and production of distant changes of tissue (termed "elongation"). These results appear to show that continuous waves give a cleaner surgical section, with greater risk of immediate hæmorrhage, but less risk of delayed (secondary) hæmorrhage.

Other Applications.—A group of treatments the uses of which are often empirical rather than rational includes electromagnets for extracting foreign bodies, "galvanism" (dry battery), "faradism" (interrupted induction coil), "sinusoidal" current (rotary convertor, a.c.), electric cautery, "Bergonic" treatment (faradic), static electricity (condenser discharge), heating (high-frequency fields, lamps, infra-red-rays, light baths), brush-discharge ozone generation, &c.

Conclusion.—The English conception that "the radiologist does not make the diagnosis" is wrong; the radiologist and pathologist are perhaps responsible for the major portion of all definite diagnoses and, as nowadays the radiologist has been trained in medicine and surgery, it is common sense that, having facilities of diagnosis not available to the non-radiologist, he is in a better position than the non-radiologist to form an opinion. In the future the radiologist will no longer consent to be the drudge of medicine, but will claim that he is perhaps the most highly trained man of the medical and surgical team. The time will soon come when practitioners responsible for general medical treatment will first refer the patient to a radiologist and, according to his finding, will or will not later refer the patient to a consultant surgeon or physician.

Discussion in London.

Dr. THURSTON HOLLAND, president of the British Institute of Radiology, in opening the discussion, said that he felt that the paper was rather down on British radiology. He did not take that view; this country produced the first book on the subject in the world, formed the first radiological society in the world, and started the great series of conferences on radiology, which had been, and would be, of immense value to all countries. British recommendations on radiology at the last conference had been accepted internationally. There was a tendency abroad to build too powerful apparatus,

giving a larger output than required. He had never seen a radiograph in the large institutions on the Continent against which he could not put up an equally good show with his own small apparatus. This was the first country to realise that protection was necessary; it was far better to have overdone protection than to have underdone it.

Mr. G. G. Blake agreed with the author as to the superiority of X-rays over radium. X-rays could be fairly well controlled; with radium the Gamma rays had their own wavelength which could not be altered. He predicted that the radium vogue would spend itself. He could not agree that medical students could obtain the necessary electrical engineering knowledge after a few months' study; four years was more like the required time. With regard to the author's observations as to unpleasant static effect, he had found that if one kept to radio frequency and the correct voltage, there was no faradic sensation, but if a capacity of one microfarad was introduced and audio frequency used, then there was decided faradic sensation. He was not sure that Henry was the first to use florescence; Campbell Swinton certainly first suggested the idea.

Dr. G. B. B. Batten strongly advocated more and better co-operation between the radiologist and the physician, dentist, and others concerned. X-ray work was only one aspect of the question, and was not claimed to be the most important one.

Mr. W. E. Schall thought there should be differentiation between cases in which electricity was used direct on the body and in which it was first converted into other forms of energy. Of the two methods, less was known of the effects, &c., of the direct application of electricity. The doctor was up against a bigger problem than the engineer; the latter could reduce his problem to one or two variables, while the medical man had to contend with the human body, which was liable to all sorts of complex variables under the effect of current. It was essential that both the engineer and the doctor should converse in a common language, and that was to be found in physics.

Mr. R. S. Wright objected to the statement that there had been a large number of deaths from electric shock. There had certainly been some; but since then steps had been taken to give adequate protection. It was now possible to protect fairly large equipment. He considered it amazing how quickly medical men and radiographers had grasped the complicated problems of h.t. electrical engineering. Modern X-ray plant deserved the attention of the I.E.E. to a greater extent. The time was coming when it would be recognised that modern X-ray plant should be under the control of a man with a thorough electrical training, and when the appointment of such a man would also be recognised.

Mr. L. G. H. Sarsfield thought that the difference of voltage due to load was the result of the regulation of the transformer, rather than of the change of space charge in the X-ray tube. It was the experience of the Research Department, Woolwich, that valves did not stand really high voltages, and that they also permitted the passage of inverse to an undesirable degree. A disadvantage of the synchronous motor was the possibility of its pulling into synchronism so as to apply wrong polarity to the X-ray tube. Connecting the milliammeter in the earthed mid-point of the transformer circuit had considerable advantage, in that the instrument could then be mounted on the control board. The difficulty of measuring a.c. could be overcome by using a moving-coil instrument fitted with a copper-oxide rectifier to give the mean value. The error in the instrument due to the transformer capacity currents passing in the condenser formed by the coils and the tank had hitherto precluded the use of this method of measurement, but experiments were being conducted on the problem at Woolwich, and Mr. F. E. J. Ockenden had devised a compensator by which currents equal and opposite to the unwanted capacity currents were circulated through the instrument during operation.

Mr. C. H. Holbeach did not consider that the radiologist should be an engineer. A motor-car in inexperienced hands was just as dangerous as X-ray apparatus.

Replying to the discussion, Dr. Leggett said he had submitted his paper to five members of the panel, and they had all expressed totally different views. He certainly had no idea of decrying protection. British apparatus, although more cumbersome than foreign equipment, was the best in the world. He objected to the radiologist being regarded as a radiographer.

Electricity in Mining.

In a recent lecture to the Derbyshire Mining Students' Association at Chesterfield, Capt. P. S. Hay, chief engineer to the Safety in Mines Research Board, said that in American mines haulage was in all cases electric, either by trolley wire or storage-battery locomotives. In mines where the roof conditions of the main roads were very bad, storage-battery locomotives were invariably used. A new development in the application of electricity for the operation of underground machinery was being watched. It was termed the "wireless" system, the whole of the electricity required being supplied by portable storage batteries. In two mines which he visited that method was used for the operation of haulage locomotives, coal cutters, pumps, loading machines, fans, and drills, no power distribution lines of any description being taken into the workings.

Institute of Metals.

Report of the annual general meeting and synopses of papers read thereat.

THE annual general meeting and dinner of the Institute of Metals were held in London in March. Dr. R. Seligman delivered his presidential address and the report of the Council was presented. The Institute has five provincial sections and a membership of 2,122, over 40 per cent. of which is foreign.

International Co-operation.

Last year's autumn meeting in Germany emphasised the desirability of closer international co-operation, particularly with regard to metallurgical research. The suggestion was warmly taken up by the French and German members of the Institute present at Dusseldorf and, as a result, an effort has been made to bring about a preliminary conference in London for the purpose of discussing the possibility of forming an International Metallurgical Research Organisation to secure closer co-operation in future.

Corrosion Research.

The transfer to the British Non-ferrous Metals Research Association of the control of the research work, particularly relative to steam condenser tubes, which has been conducted continuously by the Corrosion Research Committee of the Institute since 1910, became effective on January 1st, 1930. Henceforth the work will be controlled, directed, and financed by the Association. It will be continued on its present general lines by the investigator (Mr. R. May, A.R.S.M.) working in the laboratories of the Royal School of Mines under the supervision and guidance of Prof. Sir Harold Carpenter. It is understood that the sub-committee responsible for the work will include strong representation of the Institute of Metals and, if possible, of some of the users of condenser tubes who have been members of the Corrosion Research Committee.

Synopses of Papers.

A number of papers were presented and discussed at the meeting, among which were the undermentioned ones:—

"Experiments on the Influence of Gases on the Soundness of Copper Ingots," by N. P. Allen (the University, Birmingham). The unsoundness of commercial ingots is due to hydrogen and cuprous oxide together, which react in the solidifying metal to evolve steam, a phenomenon very difficult to suppress so long as cuprous oxide is present in the metal. Those elements which, when added to copper, endow it with the ability to cast soundly, do so by reducing the cuprous oxide present. Carbon monoxide, carbon dioxide, and nitrogen are inert, so far as the formation of blowholes is concerned. A method is described of studying the equilibria of hydrogen and cuprous oxide when present together in molten copper.

"Gases in Copper and their Removal," by W. E. Prytherch (National Physical Laboratory, Teddington). The degree and nature of unsoundness due to dissolved gases depend on temperature, on the rate of solidification, and possibly on the shape of ingot formed. Dissolved gases may be partially removed by: (1) slow solidification, followed by remelting of the copper; (2) passing an inert gas, such as nitrogen, into the molten metal; and (3) melting *in vacuo*. Experiments carried out to determine whether oxygen would remove hydrogen from copper sufficed to show that the rate of oxidation of the hydrogen was so slow as to make the method unpracticable.

"Investigation of the Effects of Impurities on Copper: Part VI.—The Effect of Phosphorus on Copper," by D. Hanson, S. L. Archbutt, and Grace W. Ford. Previous published work on the subject is summarised. The tests relate principally to rolled material. Phosphorus removes oxygen from copper and improves its casting properties. Small amounts of oxygen can be found together with phosphorus in copper, depending on the amount of phosphorus present. Removal of oxygen by phosphorus improves the cold-working qualities of copper. Copper containing up to 0.95—1.2 per cent. phosphorus can be hot-rolled, and up to 0.79—0.95 per cent. cold-rolled from cast billet. Phosphorus improves all those mechanical properties of copper which have been studied, and raises the softening temperature of cold-worked material. It is seriously detrimental to electrical conductivity, which may be attributed to the fact that it is markedly soluble in solid copper. The wrought alloys of higher phosphorus content exhibit a small amount of age-hardening after suitable heat-treatment.

"Protective Value of some Electro-deposited Coatings," by L. Davies and L. Wright (Research Department, Metropolitan-Vickers Electrical Co., Ltd.). The work outlined represents investigations carried out during 1929 on a large number of specimens of steel, brass, phosphor-bronze, and copper. The specimens were plated with cadmium, zinc, nickel, and chromium of thicknesses of 0.0001 in., 0.0005 in., 0.001 in., and 0.002 in., and subsequently exposed to accelerated corrosion tests. Under the conditions outlined cadmium afforded better protection than zinc against sulphuric acid spray. Against salt spray the thinnest deposits of zinc gave better protection than corresponding cadmium deposits. In general, for equal thicknesses of zinc and cadmium the intrinsic protection afforded by zinc more than compensated for its higher solution potential. Chromium deposits afforded no

protection whatever to steel, but very good protection was afforded to the non-ferrous basis metals. A deposit of 0.002 in. of nickel was found necessary to give any degree of permanent protection to steel. For general purposes nickel deposits appear to be most suitable, but no deposit can be recommended unless the service conditions are known.

"Atmospheric Action in Relation to Fatigue in Lead," by Bernard P. Haigh (Royal Naval College, Greenwich), and Brinley Jones (Technical College, Bradford). The paper gives a detailed account of a number of fatigue tests carried out under abnormal conditions that were specially devised to study the action of air in relation to fatigue in lead. An oil-bath round the test-piece, or even a water-bath, greatly delays fatigue and a thin layer of grease delays fatigue appreciably. A bath of acetic acid appears to eliminate fatigue, although a thin film of the acid does not do so. Fatigue fracture is intercrystalline only round the margin and, in general, the interior surface of a fatigue fracture differs in character from the marginal zone. The experiments are regarded as showing that oxygen diffuses through lead subject to cyclic stress, and that, at an appreciable depth below the surface, it provokes conjoint chemical and mechanical action that leads to fatigue cracking.

Correspondence.

***Correspondents should forward their communications as early as possible.** No letter can be published unless we have the writer's name and address in our possession.*

Motor Users and the Frequency Change.

Surely the champions of dual-frequency motors cannot see wood for trees!

The primary object of the change of frequency from 25 to 50 cycles is standardisation, and all the benefits which accrue from standardisation.

Why then, for the sake of a few hours' trouble in changing a machine, should I standardise on a non-standard expensive motor, such as the dual-frequency motor?

I expect motors to last for at least 20 years, so that I intend having the right machine—a standard motor specifically designed for the supply on which it has to operate.

I am of opinion that motor makers would be furthering the interests of this country better by concentrating on standard motors, than by developing special machines such as dual-frequency motors. The latter, after all, will have a limited application and will be obsolete as soon as the frequency change takes place.

Have dual-frequency motors been designed for the immediate benefit of the motor maker or for the ultimate benefit of the user?

Logical.

March 21st, 1930.

I am very much interested in Mr. Huggins's reply to my remarks on the above question, particularly as he appears to be disappointed with the response to his article. May I repeat, as one who believes in the advantages generally of dual-frequency motors as against the replacement scheme, that Mr. Huggins has dealt with the problem from the individual designer's point of view; the fact that he, personally, is unable to solve some of the problems which he mentions does not preclude other designers from finding solutions. In my remarks I preferred to deal with the case as I have found it in actual practice and by the results achieved. The reason that I quoted only 50-cycle efficiencies is mainly because the 25-cycle running conditions are now a temporary measure, and wishing to condense my remarks it seemed to me that the fact that there is a net gain is sufficient proof that the efficiency bogey is purely an artificial one created by parties who apparently cannot, or do not want to, build a dual-frequency motor.

Mr. Huggins will no doubt be pleased to learn that during the transitory 25-cycle stage the requirements at the factory cited by me will be just over 1 h.p. more than it would have been had straight 25-cycle motors been installed, but I now find that in working out the 50-cycle conditions I underestimated the gain of the dual-frequency motors, actually it is about 4½ h.p. instead of 2 h.p. better than straight 50-cycle motors; surely this is a strong enough argument for dual-frequency motors.

Now about power factor. The overall power factor of the dual-frequency motors installed is at 25 cycles substantially the same as it would have been with single-frequency machines, but the dual-frequency motors have a distinct advantage over the latter when the change-over to 50 cycles takes place. At the present time the main busbar power factor never falls below 85 per cent. under normal working conditions, although there is no power factor improvement apparatus whatever installed. Curiously enough, a similar factory equipped about twelve months ago with 25-cycle motors by another maker has a busbar power factor very little higher than 70 per cent., although the loading conditions of the motors are no worse than those of the dual-frequency motors.

Mr. Huggins may draw whatever inferences he likes from the facts that I have laid before you, but the user who stops to think will realise that it is possible to buy dual-frequency motors with all-round performances equal to single-frequency motors, and, although the dual frequency machines are more robust, the price to him is the same as for the straight 25-cycle machine; in other words, the former is liberally built like machines were until the market prices fell, whereas the standard article to-day is necessarily "cut to the bone" in view of the low market prices ruling. Add to this the enormous advantages of having to change over only the terminals of the motors when the frequency change takes place, and one realises why the number of buyers of dual-frequency motors is on the increase.

Cycle.

March 21st, 1930.

Accumulator Charging Prices.

We have at various times seen letters on the above subject published in your columns, and in your issues of February 21st and 28th there appeared two, from Mr. E. A. Geoch and "Amateur."

It has often been suggested, by people unaware of the impracticability of the scheme, that standard prices for recharging accumulators should be adopted all over the country. In theory the idea is excellent, but in reality it is not possible.

For instance, there are, roughly, 600 "Exide" service stations in Great Britain, which amongst them charge a good proportion of the accumulators in use, but the cost of current consumed by these agents varies from ½d. per kWh to as much as 10d., or even 1s. Although electricity does not constitute the most costly item of battery recharging, it is obvious that in a district where, say, 6d. per kWh has to be paid, the owner of the battery must pay a higher price than in areas where electricity costs but ½d. per kWh.

The chief factors which control recharging prices in any given district are (*a*) the number of cells handled per day by the individual charging firm; (*b*) the overhead costs incurred in so doing; and (*c*) local competition.

A well-organised battery service station in a large town, with many hundreds of cells coming in daily, can naturally turn them out at a price far below that which would have to be charged by a small provincial trader charging half-a-dozen batteries per day, although both might do the job equally well. An attendant has to be in charge of the battery room, irrespective of the volume of charging being done, and rent, rates, and taxes have to be paid by both large and small, so a moments reflection should make it clear to your readers why one owner has to pay only 6d. for having a 2-volt 30-Ah battery recharged, whereas his less fortunate brother in another locality has to part with twice that sum.

Further, we should like to point out that simply passing a current through a cell is not our idea of recharging; a proper "re-charge" should include testing, topping-up with distilled water, cleaning and vaselining the terminals, and washing all traces of acid from the cell before it is returned to its owner, and each little item tends to increase the cost. Under no circumstances should these services be charged for as extras—the recharging price should include everything.

We have not referred to collection and delivery, as, although many large service stations include this facility for the same all-in price that their lesser brothers have to charge without it, the fact is simply another indication that recharging prices are largely dependent upon the number of cells handled, the overhead costs, including current, and the service rendered.

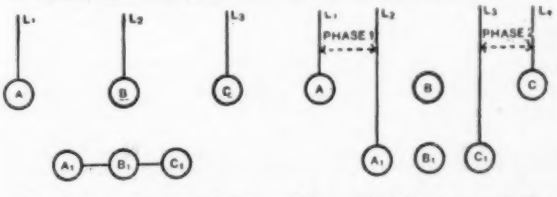
Chloride Electrical Storage Co., Ltd.,

GRINNELL S. HARVEY,
Manager, Exide Service.

Clifton Junction, *March 21st, 1930.*

Alternators for Two- or Three-phase Operation.

Will any of your correspondents be kind enough to inform me where I can obtain a diagram of windings and connections for an alternator with which the phase angle can be changed from 120 deg. to 90 deg., so that the machine can be used for supplying three-phase or two-phase current?



The change of connections would be effected by means of a six-pole double-throw switch on the machine panel, the terminal arrangements being as shown in the accompanying diagrams.

Phi.

March 18th, 1930.

Conditions in Spain.

I wonder whether any of your readers can offer information as to the prospects of securing a position in Spain or Portugal for a man who has had good electrical experience in South America, and who speaks Spanish well.

It is very difficult to discover which British firms, if any, are operating regularly in Spain, or even whether any appreciable amount of electrical work is being carried on there.

Any help from your readers who may have up-to-date knowledge of Spanish conditions would be much appreciated by—

Spain.

March 25th, 1930.

A Use for Old Accumulators.

Many people up and down the country collect tinfoil and leadfoil from cigarettes and chocolates, &c., for their local hospitals, but what about worn-out wireless accumulators and car-starting and lighting batteries, &c.? These weigh far heavier than tinfoil, and indeed, a heavy old car-starting battery must represent at least a lifetime's work for anybody collecting tinfoil, and a small worn-out wireless accumulator a good many months of it.

The metal of accumulator plates contains a certain proportion of antimony, which renders them considerably more valuable than ordinary scrap lead. At the same time worn-out accumulators are often only lumber and people would be very glad to be rid of them. Also hospitals selling collections of old accumulators in quantities direct to the smelters would be able to obtain a far better price for them than anybody would be able to get for only one or two. It would thus be a very economical proposition to follow, in addition to benefiting the hospitals very considerably.

Of course, an old accumulator does not look such a nice gift to take to a hospital as a bright ball of silver paper, but an old accumulator would be far more valuable, and a hospital is not built for show, but for strictly practical purposes. No doubt people would be pleased to organise collections of old accumulators in their district for the local hospital from time to time. With the millions of wireless users and the large number of motor cars in use, it seems to be an idea which would benefit the hospitals of the country to the extent of thousands of pounds in the aggregate if it were generally adopted, and who is not interested in hospitals?

E. Pickworth Farrow,
Spalding, *March 20th*, 1930. D.Sc.

A Menace to Electrical Prosperity.

I should like to refer briefly to the article by Sir Hugo Hirst in your issue of March 21st, and to suggest that for one brief moment we look upon ourselves as the "foreigner" to the nations outside, to whom we export electrical equipment.

If we imported £8,400,000 of electrical material of all types, what did we as the "foreigner" export, or dump, on nations outside our islands, during the same period? And if the argument holds good about keeping these imports out, does it not equally apply to our exported goods being kept out of countries to which we ship them, given the ability of these outside nations to make the material, and their desire to do so? Is not a good deal of this material of a special character which Britons have not in the past manufactured (or only recently have taken up), and are we not ourselves to blame for taking a good deal of such material, never having made the attempt to furnish a corresponding British product, until a market has been cultivated, and built up, by the foreigner?

Take the repulsion-induction motor—the Americans were alive to this gear long years ago, and we let them get well "dug in" before any attempt was made to make it here. Again, take refrigerator panels for the home. We knew legislation was cutting out preservatives, yet we let America send in high-priced (and highly profitable) refrigerator panels and gear, long before any attempt was made to put on the market here a British product. Even lamps were largely in the hands of the foreigner until the war started, and we had difficulties in gasfilled lamps when 1914 came along and Continental supplies were cut off. Personally, I have never bought, knowingly, goods of foreign manufacture, and would not do so in the "odd" case, if a British product were available, but we must export, and we must perforce accept goods in return, as international trade is pure barter. We cannot expect the whole world to sit on their haunches, and let Britain make the whole of the material requisite, and the sooner we recognise this the better it will be for us all in these islands.

If our industries were protected by a tariff, would not prices rise, both in this country and on exported equipment, and if prices rose, would not our export trade suffer still further? (To put on a tax does not make for cheapening equipment; it is against all laws of economics, and I have never found a manufacturer who would be prepared to guarantee that his product would not rise in price, if his products were protected by a tariff.) And why a tariff tax at all? If imports are a menace to us, why not a total embargo? Does Sir Hugo Hirst know anything of the jugglery of rings, and the price boards which sit in London?

With an intimate knowledge of the whole of the allied electrical manufactures extending over some 40 years, I am absolutely certain that reorganisation is what is essentially necessary in the British manufactories, and I ask any captain of industry to leave the board room and spend a few months in his shops, and he will be forced to the same conclusion. Finally, is it not illuminating to note the low wages of the workmen in these highly protected countries?

March 22nd, 1930. **Britisher.**

Sir Hugo Hirst's article in your current issue is both illuminating and instructive. It leads one to think back to the early days of what is now an immense electrical manufacturing and selling organisation. I have a vision of a small electrical stores with a stock of accessories and lamps, shall I say, not wholly British-made. Just in the same way others have started, and are starting, to build up what in time may be prosperous businesses, and possibly manufacturing businesses.

To avoid any misunderstanding let me say here that I am an out and out "safeguarder" and protectionist. If I sell a foreign article it is because it is not made over here. Why I am so foolish I don't know, but there it is. Now what is the cause of this huge import of foreign electrical accessories which Sir Hugo talks about? The first question one asks is: "Are the accessories not made in this country?" The answer is definitely "Yes, they are." The next question is: Are the accessories generally of better quality, or better design, and the answer is in both cases emphatically "No." And finally one asks: "Are they cheaper?" and whilst one can answer "No, quality for quality," there does seem to be a certain limited demand for the cheap and nasty. On the whole, however, it is necessary to look for some further reason for the fact that a large number of reputable British merchants, or wholesalers, or factors, or whatever you like to call them, do import, and sell, foreign-made accessories, and to some of us this reason is well known.

Twenty years ago not only Sir Hugo Hirst's company, but other manufacturers of electrical commodities also, were working in harmonious combination and co-operation with the merchant or wholesaler. Then came this craze—it cannot be called anything but a craze—for opening branches. The only people who can outdo the electrical manufacturers in this are the banks. As a result, the merchant, or wholesaler, found himself faced with the competition of those whose goods he had introduced, and found a market for. Well, he wasn't going to be snuffed out, so he had to look out for other markets—home or foreign—and, judging from Sir Hugo's figures, he has been pretty successful in maintaining his position as the legitimate distributor of electrical commodities in this country, but at some cost to the country. And what has the manufacturer gained by this multiplicity of branches? I venture to say nothing but a considerable loss. Take this district for example. Every electrical manufacturer of any account has a branch office and/or stores. Not content with this, many of them have duplicate stores in Swansea—45 miles—and in Bristol—40 miles—away. The population of Cardiff is 200,000, of Swansea 150,000, and of Bristol 375,000. Travellers galore are attached to each branch. If a colliery sends out an inquiry for £100 worth of accessories, and delays ordering, travellers in battalions will be in waiting at intervals of a few days. The total cost of obtaining the order will no doubt be more than its total value. And so the selling costs go up until it is impossible to compete. What is happening in this district has happened, or is happening, all over the country.

May I be bold enough to tender this advice to Sir Hugo Hirst, for whose company—and himself—I have every admiration? Use the distributing organisations and services of the merchant or wholesaler. He is, I believe, ready and willing to give—for a consideration, the labourer being worthy of his hire—such services. By this means encourage the merchant or wholesaler to sell British instead of forcing him, by stress of competition, to sell foreign. Proof of the efficiency of the selling organisations referred to has been amply given by Sir Hugo Hirst's own figures, so it will be unnecessary to amplify this point. Finally, I would suggest that such co-operation, as indicated, as a means to an end, would win over to the cause of safeguarding and protection a large number of those who, in protecting their own interests, have to hold other views.

Theodore Stretton.

Cardiff, *March 24th*, 1930.

Salemen's Conferences and Qualifications.

I was an interested visitor to the E.D.A. "Conference" (?) held last week, the subject being "Selling Policy and Practice in Electricity Supply Undertakings." At the close I speculated as to the usefulness of such meetings. A few managers and sales managers outlined their respective policies and the conference was then open for discussion, out of which nothing tangible transpired, except a complaint by one speaker of the low salaries paid to sales staffs. Apart from the few higher officials who spoke, I am of opinion that the general attendance consisted of the rank and file of sales staffs who were present with the sole object of learning what the other people were doing and not to contribute to the general exchange of ideas, assuming, of course, that they were qualified to do so. The sales staffs of undertakings, as I see them at present, are composed of men whose technical knowledge, if any, is limited to Ohm's Law and who manage to carry on simply because the great majority of consumers and potential consumers are entirely ignorant of matters electrical. To such, E.D.A. conferences are a source of information on matters which should have been assimilated prior to their appointment to any sales job.

What does the industry hold forth to a man who can *represent* an undertaking? By this I mean discuss with, and advise, any prospective consumer, whether housewife, shopkeeper, or works manager, on any matter connected with electricity supply for lighting, heating, or power, and can instil in the client a feeling that he is in safe and capable hands. Such men are to my knowledge seeking appointments, but are frozen out by the host of clerks, canvassers and meter readers who have been "promoted" to administrative posts in sales departments. The industry is the loser by past policy and until the "goods" are represented by capable men E.D.A. conferences will be necessary, but at such conferences the real men will not air the results of years of experience for the delectation of the present school.

Nemo.

March 24th, 1930.

Legal.

Sequel to an Electrical Fatality.

IN the Court of Session, Edinburgh, on March 19th, an issue was approved for the trial by jury of an action for £750 as damages in respect of the death of a wife. LORD MONCRIEFF said that the wife of the plaintiff, while engaged in cleaning a flat, received a fatal electric shock due to the defective insulation of a circuit serving an electric drop lamp. The plaintiff asked for an award of damages against the tenants as her employers. He maintained that the lamp was in a dangerous condition, which was not obvious to his wife, but of which the respondents ought to have been aware. His Lordship was of opinion that the factors and agents, who were first cited as respondents, were not liable. On the other hand, the tenants of the house were bound to make all reasonable provision for their employés' safety in the premises. The only such provision which counsel for the plaintiff was able to suggest was the making of an inspection of the premises after the tenants had taken them over and before they set their employé to work. His Lordship was of opinion that such a duty of inspection was one which the jury would be entitled to affirm.

Damage to a Post Office Cable.

JUDGMENT was given in the Court of Session, Edinburgh, on March 20th in an action at the instance of the Lord Advocate, as representing the Postmaster-General, against the Gala Water District Committee of the Midlothian County Council. On January 20th, 1928, the Edinburgh to Newcastle underground telegraph cable was damaged and the service was interrupted. Electrical tests disclosed that the fault existed at a point north of Stow, on the Edinburgh-Galashiels road. Plaintiffs averred that damage to the cable was done by the respondents' workmen while engaged in digging up the road for the purpose of clearing a choked culvert. The respondents denied fault. By agreement the parties restricted the case to the question of liability, the damages, if such were found due, being fixed at £800.

LORD MURRAY found against the respondents for the agreed sum, with expenses modified to two-thirds. His Lordship said that in his opinion the facts in the case disclosed negligence on the part of the respondents' servants.

Dakol Electric, Ltd.

ON a motion by Mr. O. C. Clare and other debenture-holders, a receiver and manager of Dakol Electric, Ltd., was appointed by Mr. Justice Luxmoore, in the Chancery Division, on March 21st.

Counsel for the plaintiffs stated that the company had entered an appearance to the action and consented to the appointment together with the usual judgment in a debenture holders' action.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

24,131. "Thermionic valves." Loewe-Audion Ges. and B. Wienecke. August 22nd, 1927. (296,005.)

24,323. "Apparatus for producing ultra-violet rays for treating living organisms." Siemens & Halske Akt. Ges. September 6th, 1927. (296,724.)

24,465. "Loud-speaker and like horns." F. W Lanchester. August 25th, 1928. (325,784.)

24,754. "Windings for alternating-current machines." Siemens-Schuckertwerke Akt. Ges. October 8th, 1927. (298,467.)

25,064. "Single-layer windings for dynamo-electric machines." Siemens-Schuckertwerke Akt. Ges. October 10th, 1927. (298,528.)

27,164. "Apparatus for indicating electrical short circuits." Ganz-Fese Villamossagi Reszvenytarsasag. September 22nd, 1927. (297,473.)

30,756. "Apparatus for the telegraphic transmission of visual representations." L. P. Todd. October 24th, 1928. (325,790.)

31,333. "Electric switchgear." Siemens-Schuckertwerke Akt. Ges. November 5th, 1927. (300,122.)

31,473. "Supporting electric cables." A. Huyler. July 4th, 1928. (314,893.)

31,525. "Switch controls and the like." S. C. Winfield-Smith and Burovox, Ltd. October 30th, 1928. (325,821.)

31,529. "Internal-combustion engines utilising the gaseous mixture obtained from the electrolysis of water." Dr. C. Firpo. October 30th, 1928. (325,866.)

31,800. "Electrostatic devices for sound reproduction." C. Kyle. November 1st, 1928. (325,868.)

31,852. "Plug contact connection for interchangeable current transformers of enclosed switchgear." Siemens-Schuckertwerke Akt. Ges. November 8th, 1927. (300,205.)

31,856. "Electric discharge tubes." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). November 1st, 1928. (325,870.)

34,226. "Tunnel or enamelling pottery kilns." Electric Furnace Co., Ltd., and W. J. Millar. November 21st, 1928. (325,794.)

34,420. "Circuit arrangements for controlling temperature, voltage, speed, or the like." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). November 22nd, 1928. (325,874.)

34,708. "Small condensers and inductances." E. B. Moullin. November 26th, 1928. (325,802.)

34,723. "Electrically-heated bakers' ovens." A J. Rhodes. November 26th, 1928. (325,826.)

34,785. "Thermionic sound amplifiers." F. W. W. Robinson and "M.P.A." Wireless, Ltd. November 26th, 1928. (325,812.)

34,792. "Vacuum electric tube devices." E. Y. Robinson and Associated Electrical Industries, Ltd. November 26th, 1928. (325,827.)

34,804. "Starters for airplane or other engines." F. H. Rogers (Eclipse Machine Co.). November 26th, 1928. (325,803.)

34,811. "Electrical discharge tubes especially applicable to the photographic recording of sound vibrations." F. Ehrenhaft. November 26th, 1928. (325,813.)

35,040. "Phase compensation for electric wave transmission." Standard Telephones and Cables, Ltd., A. R. A. Randall, and E. K. Sandeman. November 28th, 1928. (325,829.)

35,041. "Automatic and semi-automatic telephone exchange systems, and apparatus therefor." Standard Telephones and Cables, Ltd., and E. P. G. Wright. November 28th, 1928. (325,830.)

35,081. "Electron-discharge amplifying apparatus." R. E. H. Carpenter. November 28th, 1928. (Cognate application, 17,295/29.) (325,833.)

35,109. "Electric signalling or controlling systems." Associated Telephone and Telegraph Co November 28th, 1927. (301,399.)

35,212. "Resonantly-controlled electrically-operated mechanisms." Siemens-Schuckertwerke Akt. Ges. December 2nd, 1927. (301,508.)

35,215. "Electric elevator and like control systems." Associated Electrical Industries, Ltd. (Westinghouse Electric and Manufacturing Co.). November 29th, 1928. (325,838.)

35,298. "Electric acoustic devices employing a moving coil." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). November 30th, 1928. (325,843.)

35,585. "Electric discharge tubes." General Electric Co., Ltd., and N. R. Campbell. December 3rd, 1928. (325,885.)

36,376. "Mercury-arc rectifiers." British Thomson-Houston Co., Ltd., and F. P. Whitaker. December 10th, 1928. (325,907.)

36,380. "Electric discharge devices." British Thomson-Houston Co., Ltd. December 10th, 1927. (302,168.)

36,436. "Sound-reproducing devices." British Talking Pictures, Ltd. December 10th, 1927. (303,828.)

37,029. "Gasfilled electric discharge devices." Siemens & Halske Akt. Ges. December 17th, 1927. (302,583.)

37,558-9. "Engine-starting apparatus." A. E. White (Delco-Remy Corporation). December 19th, 1928. (325,917-18.)

37,643. "Arrangements for effecting tap-changing of transformers under load." General Electric Co., Ltd., and C. H. Nunn. December 20th, 1928. (325,919.)

38,434. "Vacuum discharge device." Dr. A. Katsch and Loewe-Audion Ges. December 31st, 1927. (303,370.)

1929.

84. "Electric imitation fires." H. H. Berry. January 1st, 1929. (325,934.)

540. "Heating or melting of metals or alloys by induced currents of electricity." Dr. C. Tama and Electric Furnace Co., Ltd. January 7th, 1929. (325,940.)

865. "Electric commutating switches." J H. Needham and H. C. Andre-Wartha. January 10th, 1929. (325,945.)

954. "Sound-reproducing devices." British Talking Pictures, Ltd. January 10th, 1928. (303,837.)

1,506. "Means to control the lighting of taximeter vehicles." E. W. Hill and Aron Taximeters, Ltd. January 19th, 1929. (325,954.)

2,664. "Apparatus for controlling the voltage ratio of electric transformers." A. West & Co., Ltd., and F. Bergmann. January 25th, 1929. (325,958.)

2,848. "Dynamo-electric machines." English Electric Co., Ltd., and J. C. Wilson. January 28th, 1929. (325,962.)

3,331. "Selectors for automatic telephone exchange systems." F. Merk. January 31st, 1929. (Convention date not granted.) (307,338.)

3,483. "Telephone instruments." Celestion, Ltd., and C. French. February 1st, 1929. (325,976.)

3,575. "Method of and apparatus for synchronising the movements of two devices arranged at a distance from one another." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). February 2nd, 1929. (Cognate application, 7,190/29.) (325,979.)

4,637. "Alternating-current dynamos." B. J. Shillito. February 12th, 1929. (325,989.)

5,640. "Methods and apparatus for operating electric clock installations." International General Electric Co., Inc. February 22nd, 1928. (306,507.)

8,714. "Wehnelt cathodes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 13th, 1928. (309,578.)

9,022. "Insulators for the primary conductor of a current transformer." Siemens-Schuckertwerke Akt. Ges. March 28th, 1928. (308,797.)

9,467. "Measuring arrangements for measurement of ratio of transformation and phase angles of voltage and current transformers." J. Slavik. April 5th, 1928. (309,128.)

9,734. "Induction motors." British Thomson-Houston Co., Ltd. March 30th, 1928. (308,807.)

9,804. "Insulating supports for electric wires and cables." Callender's Cable and Construction Co., Ltd., and C. W. Kay. March 27th, 1929. (326,045.)

9,859. "Prepayment electricity meters with means for preparing a basic charge." Landis & Gyr Soc. Anon. April 25th, 1928. (310,412.)

10,612. "Means for introducing electric current into a metallic vacuum discharge vessel." W. Dallenbach. April 7th, 1928. (Addition to 252,698.) (309,185.)

12,470. "Electric lamps." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). April 22nd, 1929. (326,073.)

13,411. "Electric switches of the tumbler type." C. L. Arnold and M.K. Electric, Ltd. April 30th, 1929. (326,079.)

13,561. "Electric hand lamp." E. Rademacher. May 1st, 1929. (326,083.)

15,186. "Self-starting synchronous electric motor." Landis & Gyr Soc. Anon. June 16th, 1928. (313,595.)

18,101. "Fitting pieces for electric tubular lamps." Gottschalck Electro Ges. July 19th, 1928. (Addition to 262,424 and 267,442.) (315,824.)

19,381. "Apparatus for operating Röntgen tubes." Siemens-Reiniger-Veifa Ges. für Medizinische Technik. July 23rd, 1928. (Addition to 307,785.) (316,133.)

20,183. "Luminous electric discharge tubes." General Electric Co., Ltd. July 16th, 1928. (315,704.)

20,470. "Electrically-operated centre-drilling machine." E. F. Chabot. July 11th, 1928. (315,300.)

24,740. "Television and like systems and apparatus." J. L. Baird and Television, Ltd. October 26th, 1928. (Divided application on 324,309.) (325,854.)

32,226. "Elevator systems having control means dependent upon the load." Waygood-Otis, Ltd. September 28th, 1927. (Divided application on 297,801.) (325,893.)

32,227. "Elevator systems having controlling means giving preference to passengers in the elevator under certain conditions." Waygood-Otis, Ltd. September 28th, 1927. (Divided application on 297,801.) (325,894.)

32,228. "Means for controlling the direction of travel of an elevator." Waygood-Otis, Ltd. September 28th, 1927. (Divided application on 297,801.) (325,895.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 19th :—

Pacent Reproducer (lettering and design). No. 505,901. Class 8. Sound reproducing and receiving apparatus.—Pacent Reproducer Corporation, New York. (British representatives: Frank B. Dehn & Co., 103, Kingsway, W.C.2.)

Sonestra. No. 508,191. Class 8. Radio-telephonic apparatus, &c.—Ewing and McIntosh, Ltd., 425-427, Sauchiehall Street, Glasgow.

Var-Lac. No. 509,525. Class 8. Electric cables.—Flexible Electric Cords, Ltd., 7, Queensway, Ponders End, Middlesex.

Rhodophone. No. 510,064. Class 8. Scientific and philosophical instruments and apparatus for useful purposes.—A. C. Lawler, 32, Linden Gardens, Notting Hill Gate, W.2.

Porcupine. No. 510,317. Class 8. Electric cables.—Enfield Cable Works, Ltd., 296-302, High Holborn, W.C.1.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Barracks for Gordon Highlanders (£140,000); officer in command.

ALLOA.—Houses (63); burgh surveyor.

BATHGATE.—Alterations to cinema, for Star Theatre, Ltd.; the manager.

BEDFORD.—Alterations, Empire Cinema, Midland Road; F. Edward Jones.

BEXLEY.—School, for St. Stephen's Catholic managers, Welling; Rev. Clifford J. Nevatt, The Presbytery, Belle Grove Road, Welling.

BIRMINGHAM.—Offices and extension of factory, Robin Hood Lane, Hall Green; F. H. C. Wiltshire, town clerk.

BLACKPOOL.—New Church of the Holy Cross, Central Drive and Waterloo Road; Balstead Best, architect, 8, Clifton Street.

BLYTH.—Houses (31), Tenth Avenue; borough engineer.

BOURNEMOUTH.—College extensions, Lowther site (£25,000), for the E.C.

CARLISLE.—Additional 100 houses, Botcherby, for the T.C.; city surveyor.

CARNWATH.—Town hall, with electrical work; John Steel, architect, 66, Main Street, Wishaw.

CHICHESTER.—Housing scheme (72), for the T.C.; Whitehead & Whitehead, architects, 18, South Street (returnable deposit of £1).

COVENTRY.—Cinema (2,000 seats), Jordan Wells, for Provincial Cinematograph Theatres, Ltd.; W. Henry Watkins, architect, Sun Buildings, Clare Street, Bristol. Ward block (40 beds) at the Paybody Convalescent Home, for the Coventry and District Crippled Children's Guild (£5,000); J. Stephen, architect, Masonic Buildings, Little Park Street. Central Wesleyan Hall (£40,000); trustees.

CROYDON.—Library, Norbury, for the T.C.; borough engineer (returnable deposit of £3 3s.).

DOUGLAS (Isle of Man).—Extensions, Noble's Hospital; J. E. Teare, architect, 46, Athol Street (returnable deposit of £10 10s.).

DUNS.—Flats (31), for the T.C.; Gray & Paterson, architects, 2, Ivy Place, Berwick-on-Tweed.

FALKIRK.—School, for Stirlingshire Education Authority; master of works, Education Authority, Stirling.

GLASGOW.—Shops (12) and houses (24), Carntyne Hall Road; housing director.

GOSPORT.—Extensions to War Memorial Hospital (£7,000); Young & Hall, 17, Southampton Street, London, W.C., architects.

GREENOCK.—Improvement scheme (£300,000); city architect.

HAMILTON.—Housing scheme (280), for the T.C.; burgh surveyor.

HASTINGS.—Nurses' home, Royal East Sussex Hospital; secretary.

HELSBY.—Housing scheme (34), for Runcorn R.D.C.; surveyor.

HODNET.—School (400 places), for Salop E.C.; A. A. Johnson, clerk, Shrewsbury.

HORNCHURCH.—Houses (71), Lyndhurst Drive, for T. A. Clark.

IRISH FREE STATE (Cork).—Additional 155 houses, Turner's Cross, for the Corporation (£50,000).

KIDDERMINSTER.—Two central schools, for the borough E.C.; director of education. Houses, for the T.C.; Eadie, Towers & Co., Wolverhampton (122); and Griffiths & Sons, Wolverhampton (86).

LEEDS.—Houses (150) at Middleton; J. E. Ackfield, architect, Municipal Buildings. Sewage works, Rodley (£24,360); E. H. Howatson, engineer. Church and school, York Road housing estate, for the Yorkshire Association of Baptist Churches.

LINCOLN.—Extensions, County Offices (£60,000), for Lindsey C.C.; county surveyor. Admission hospital, &c., Bracebridge Mental Hospital; H. S. Hall, architect, Old Market Place, Grimsby (returnable deposit of £4 4s.).

LIVERPOOL.—Houses (1,400), Dovecot estate, Knotty Ash; land steward and surveyor, Municipal Buildings, Dale Street.

LONDON (East Ham, E.).—Housing scheme (126), Charlemont Road, for the T.C.; borough engineer.

(E.C.).—New offices, Leadenhall Street, for the Cunard Steamship Co., Ltd.; Mewes & Davies, architects, 22, Conduit Street, W.1. Telephone buildings, Knightrider Street; Postmaster-General.

LONDON (*continued*).

(Eltham, S.E.).—Crossways Hotel (£17,500), for Messrs. Beasley, Woolwich.

(Barnes, S.W.).—Swimming baths, for the U.D.C.; Francis P. Kendell, architect, Council House, High Street, Mortlake.

(Kensington, S.W.).—Shops, West Brompton station; Great Western Railway Co.

(Westminster, S.W.).—Remodelling Buckingham Palace Road Library (£6,344); Sims & Russell, Ltd.

(Paddington, W.).—Station and hotel extensions, for Great Western Railway Co.

LOUTH.—Additional 32 houses, for the T.C.; borough surveyor.

LOWESTOFT.—Alterations to theatre, The Marina; Amalgamated Theatres, Ltd. Alterations to Harbour Hotel; Harbour Hotel, Ltd. Saw mills, Belvedere Road; Jawson & Sons.

LUTON.—Town hall (£250,000); borough surveyor.

MACCLESFIELD.—Rebuilding premises and offices, for Macclesfield Co-operative Society, Ltd.; F. C. Sheldon, 7, King Edward Street.

MANSFIELD WOODHOUSE.—Additional 54 houses, for the U.D.C.; surveyor.

MELKSHAM.—Extensions, Avon India Rubber Co.'s works (£30,000); Blackford & Son, builders, Calne. Dairy buildings, for the Co-operative Wholesale Society; Long and Co., builders, Bath.

OLD FLETTON (Peterborough).—Housing scheme (72), for the U.D.C.; H. W. Hawkins, surveyor (returnable deposit of £1 1s.).

PAIGNTON.—Alterations and additions, Marine Hotel, Adelphi Road; J. T. Roach.

PENBURY.—Housing scheme (40), for Tonbridge R.D.C.; surveyor.

PENRYN.—Houses (54), for the T.C.

READING.—Houses (237), for the T.C.; Gee, Walker and Slater, Ltd., builders, Uttoxeter Old Road, Derby.

ROMFORD.—Library, Chadwell Heath; F. George Baxter, architect, 8, South Street.

SALFORD.—Girls' secondary school, Summer Hill, Pendleton; R. S. Martin, secretary to the E.C., Education Offices, Chapel Street.

SCARBOROUGH.—New building at Queen Margaret's School, for Woodard Society; T. J. Rushton, architect, 2, New Square, Lincoln's Inn, London, W.C.2 (deposit £5 5s.).

SHIPLEY.—Additions to works, Otley Road; Revill, Carter and Co.

SKYE.—New wing, Sligachan Hotel; James Shearer, architect, 36, Queen Anne Street, Dunfermline.

SLEAFORD.—Housing scheme (50), for the U.D.C.; S. F. Clare, surveyor (returnable deposit of £2 2s.).

SMETHWICK.—Housing scheme (110), Pottery Road, Warley estate; R. Fletcher, borough engineer, Council House.

SOWERBY BRIDGE.—Housing estate at Beechwood; I. Eastwood, Council Offices.

SWANSEA.—Houses (200); borough architect. Houses (52), Carnglass estate; T. & G. Spragg. Civic buildings (£350,000); Ivor Jones & Percy Thomas, architects, Cardiff. Additions to *Daily Leader* buildings; Swansea Press, Ltd.

TAUNTON.—Schools and extensions (£19,435), for the borough E.C.; director of education.

THORNE.—Cinema theatre; W. A. Kellett, architect, Lloyd's Bank Chambers, Barnard Castle.

THORNEMOORENDS (Yorks.).—Cinema theatre, for West Riding Billiards, Ltd.; T. H. Johnson & Son, architects, 20, Priory Place, Doncaster.

TRURO.—Housing scheme, George and Dragon site; city engineer.

TUNBRIDGE WELLS.—Senior boys' school, for the borough E.C.; director of education.

TUPTON.—Secondary school; C. H. Widdows, architect, St. Mary's Gate, Derby.

WHICKHAM.—Houses (64), surveyor to U.D.C.

WILLINGTON (Co. Durham).—Additional 30 houses, for the U.D.C.; surveyor.

WITHERNSEA (Yorks.).—Adaptation of Hop Villa estate, for Yorkshire Homes for Mothers (£10,000); C. D. Allderidge, architect, 10, Alfred Gelder Street, Hull.

WORTHING.—Rebuilding of Worthing Theatre; Yates, Cook & Darbyshire, architects, 43, Great Marlborough Street, London, W.1.

YEOVIL.—Houses (27), for the T.C.; Webber & Son, builders, Exeter. Houses, shops, &c., Reckleford; W. R. Roydon Cooper, architect. Garage, with heating and lighting work, for Douglas Seaton, Ltd.; Bird and Pippard, Ltd., builders.